Index to 1984 NASA Tech Briefs

Volume 9, Numbers 1-4 **FEBRUARY 1987**

Electronic Components and Circuits

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INTRODUCTION

Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Index to NASA Tech Briefs* contains abstracts and four indexes — subject, personal author, originating Center, and Tech Brief Number — for 1984 Tech Briefs.

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Originating Center Prefixes

ARC	Ames Research Center
GSC	Goddard Space Flight Center
HQN	NASA Headquarters
KSC	Kennedy Space Center
LAR	Langley Research Center
LEW	Lewis Research Center
MFS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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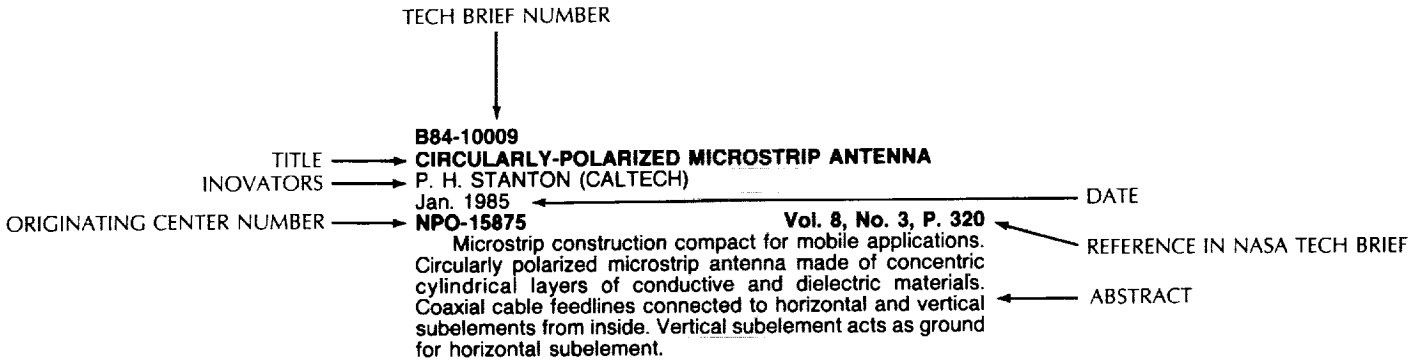
TYPICAL ABSTRACT ENTRY



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FEBRUARY 1987

Abstract Section

01 ELECTRONIC COMPONENTS AND CIRCUITS

B84-10001
BATTERY-OPERATED HIGH-VOLTAGE POWER SUPPLY
A. P. RUITBERG and M. KENNETH
Jan. 1985
GSC-12818 **Vol. 8, No. 3, P. 313**
Circuitry allows large multiplication of voltage. Filament voltage is -80kV. Potential difference between terminals P3 and P4 adjusted to make grid 80 to 150 volts more negative than filament enabling grid to focus electrons from filament into stream impinging on anode, which then emits x-rays. Circuitry provides independently adjustable voltages in kilovolt range for x-ray tubes and other instruments.

B84-10002
X-BAND STRIP-LINE POWER DIVIDER/COMBINER
B. L. CONROY (CALTECH)
Jan. 1985
NPO-16086 **Vol. 8, No. 3, P. 314**
Strip-line circuit for X-band signals both divides and combines microwave power for distributed amplifier. Strip-line pattern (foil pattern over insulating layer over ground plane) laid out so all eight distributed ports lie at electrical distances of odd integral multiples of half wavelength from main input/output port. Strip line used as power divider and as power combiner.

B84-10003
OPTICAL LOGIC GATES
E. R. DU FRESNE (CALTECH) and W. L. DOWLER (CALTECH)
Jan. 1985
NPO-15134 **Vol. 8, No. 3, P. 314**
Logic gates for light signals constructed from combinations of prisms, polarizing plates, and quarterwave plates. Optical logic gate performs elementary logic operation on light signals received along two optical fibers. Whether gate performs OR function or exclusive-OR function depends on orientation of analyzer. Nonbinary truth tables also obtained by rotating polarizer or analyzer to other positions or inserting other quarter-wave plates.

B84-10004
TUNING CONCEPT FOR RESONANT CAVITIES
R. L. SYDNOR (CALTECH)
Jan. 1985
NPO-15890 **Vol. 8, No. 3, P. 315**
Deviations from resonance detected by sampling phases. Automatic tuner feedback control system derives error signal from E and H plane probe signals. Control objective to maintain phase difference between E and H at 90 degrees. Technique estimated to sensitive to fractional frequency deviation of about 5 X 10-16 and applicable not only to masers but also other microwave elements, including klystrons, general purpose oscillators, and frequency standards.

B84-10005
ISOLATION MOUNTING FOR CHARGE-COUPLED DEVICES
W. C. GOSS (CALTECH) and P. M. SALOMON (CALTECH)
Jan. 1985
NPO-15551 **Vol. 8, No. 3, P. 316**
CCD's suspended by wires under tension. Remote thermoelectric cooling of charge coupled device allows vibration isolating mounting of CCD assembly alone, without having to suspend entire mass and bulk of thermoelectric module. Mounting hardware simple and light. Developed for charge-coupled devices (CCD's) in infrared telescope support adaptable to sensors in variety of environments, e.g., sensors in nuclear reactors, engine exhausts and plasma chambers.

B84-10006
SEMICONDUCTOR LASER PHASED ARRAY
J. KATZ (CALTECH)
Jan. 1985
NPO-15963 **Vol. 8, No. 3, P. 317**
Oscillations synchronized and modulated individually for beam steering. Phased array of GaAs infrared lasers put out powerful electronically-steerable coherent beam. Fabricated as integrated circuit on GaAs chip, new device particularly suited to optical communications, optical data processing and optical detection and ranging systems.

B84-10007
DIRECT-CURRENT UNBALANCE DETECTOR
A. P. WAGNER (CALTECH)
Jan. 1985
NPO-15978 **Vol. 8, No. 3, P. 318**
Short circuits to ground indicated by voltage changes. Current transducer connected in bridge circuit with floating 30-Vdc power supply measures voltage unbalance between positive and negative powerlines and ground. Detection circuit output swings higher or lower than normal balanced condition voltage to signify unbalance toward positive or negative side respectively. Circuit configuration adaptable to monitor 4- to 20-mA current loops often found in industrial controls.

B84-10008
CIRCUIT FOR MONITORING CELL VOLTAGES
J. W. LEPISTO (TRW, Inc.)
Jan. 1985
MFS-25924 **Vol. 8, No. 3, P. 319**
Circuit monitors voltage of each cell in electrical battery

within few millivolts. Circuit includes two bipolar analog multiplexers: repeatedly sample outputs of 12 1.5 volt cells. Terminals of multiplexer 1 connected to positive sides of cells and terminals of multiplexer 2 connected to negative sides. Outputs of multiplexers connected to differential operational amplifier: provides signals for recording and display.

B84-10009
CIRCULARLY-POLARIZED MICROSTRIP ANTENNA
P. H. STANTON (CALTECH)
Jan. 1985
NPO-15875 **Vol. 8, No. 3, P. 320**

Microstrip construction compact for mobile applications. Circularly polarized microstrip antenna made of concentric cylindrical layers of conductive and dielectric materials. Coaxial cable feedlines connected to horizontal and vertical subelements from inside. Vertical subelement acts as ground for horizontal subelement.

B84-10010
POWERLINE COUPLER FOR WINDMILL MOTOR/GENERATORS
F. NOLA
Jan. 1985
MFS-25944 **Vol. 8, No. 3, P. 321**

Efficiency at low windspeed increased by firing-angle control. Power coupled from wind-driven induction motor/generator to ac powerline with help from circuit. Circuit reduces power consumed by field windings thereby improving efficiency at low windspeeds. Circuit includes zerocrossing detector, ramp generator and comparator similar to those used to set firing angles for thyristors in power factor motor controllers.

B84-10011
IMPROVED RF ISOLATION AMPLIFIER
G. L. STEVENS (CALTECH) and J. MACCONNELL (CALTECH)
Jan. 1985
NPO-16026 **Vol. 8, No. 3, P. 322**

Circuit has high reverse isolation and wide bandwidth. Wideband isolation amplifier has low intermodulation distortion and high reverse isolation. Circuit does not require selected or matched components or directional coupling device. Circuit used in applications requiring high reverse isolation such as receiver intermediate-frequency (IF) strips and frequency distribution systems. Also applicable in RF and video signaling.

B84-10012
DIGITAL SEQUENCE CONTROLLER
J. O. LONBORG (CALTECH)
Jan. 1985
NPO-15725 **Vol. 8, No. 3, P. 323**

Length and timing of pulse sequences user controlled. Digital circuit generates several pulse streams to control loads that must be synchronized allowing duration and phasing of each stream to be varied independently. Application of circuit to control pump for biomedical applications.

B84-10013
SOFTWARE FOR PROM PROGRAMING
C. W. GOOLSBY (Rockwell International Corp.)
Jan. 1985
MSC-20641 **Vol. 8, No. 3, P. 323**

Driver program allows for programing, reading, and verification of various PROM's. Manual entry of data to DATA/I/O PROM Programmer timeconsuming and error-prone. Driver program combines file management capability of EXORCISOR with flexibility of DATA I/O system. Provides user with way of reading, programing and verifying PROM's storing data on disk, modifying files and printing data.

B84-10014
COMPUTERIZED INTERACTIVE HARNESS ENGINEERING
J. W. BILLITTI (CALTECH)
Jan. 1985
NPO-16272 **Vol. 8, No. 3, P. 324**

Computerized interactive harness engineering program inexpensive, interactive system for learning and using engineering approach to interconnection systems. Basically data-base system that stores information as files of individual connectors and handles wiring information in circuit groups stored as records.

B84-10015
ANTENNA RADIATION-PATTERN PROGRAM
R. D. HUGHES (CALTECH), C. N. GUIAR (CALTECH), and C. L. LAWSON (CALTECH)
Jan. 1985
NPO-16217 **Vol. 8, No. 3, P. 324**

Effects of reflector deformations and feed characteristics computed. JPL Antenna Radiation Pattern computer program ANRAD, evaluates performance of radio-frequency antenna with paraboloidal main reflector by solving scalar far-field radiation pattern integral.

B84-10016
TEMPERATURE-STABILIZED PHASE DETECTOR
L. YEEMAN
Jan. 1985
NPO-15766 **Vol. 8, No. 3, P. 324**

Precise temperature stabilized phase detector for clock signal distribution maintains 100-MHz signal with stability of 5 parts in 10 to the 16th power even for step changes of 20 degrees C in ambient temperature. Stabilization achieved by heating unit to 45 degrees C and maintaining temperature through bridge circuit.

B84-10017
NEGATIVELY COUPLED INDUCTORS FOR ODD-PHASE CHOPPERS
R. S. JAMIESON (CALTECH)
Jan. 1985
NPO-15380 **Vol. 8, No. 3, P. 325**

Splitting windings of output inductors of negatively-coupled 'boost' chopper extends applicability to odd number of phases including three phases. New version concatenates output inductors of each phase with those of neighboring phases achieving negative coupling effect that suppresses unwanted harmonics.

B84-10018
MATHEMATICAL STORAGE-BATTERY MODELS
C. P. CHAPMAN (CALTECH) and M. ASTON (CALTECH)
Jan. 1985
NPO-15615 **Vol. 8, No. 3, P. 325**

Empirical formula represents performance of electrical storage batteries. Formula covers many battery types and includes numerous coefficients adjusted to fit peculiarities of each type. Battery and load parameters taken into account include power density in battery, discharge time, and electrolyte temperature. Applications include electric-vehicle 'fuel' gages and powerline load leveling.

B84-10019
IMPROVED SPARK-IGNITOR CIRCUITRY
D. G. OLSCHANSKY (Rockwell International Corp.)
Jan. 1985
MFS-19751 **Vol. 8, No. 3, P. 325**

Transformer reduces flyback voltage 350 V. Several modifications made to inductive discharge spark-ignitor system for rocket engine, which substantially reduce complexity of circuits and eliminate difficulties associated with component matching.

B84-10020
STOWABLE SOLAR-CELL ARRAY
P. M. STELLA (CALTECH)
Jan. 1985

NPO-15893 **Vol. 8, No. 3, P. 325**

Solar electric power source easily storable and transportable. Source employs blanket of photovoltaic cells rolled up when not in use. The hollow core of canister reel used as storage space for radio equipment or first aid supplies, etc.

B84-10021
BURNWIRE SIMULATOR
G. L. BUMMER (CALTECH)
Jan. 1985
NPO-15883 **Vol. 8, No. 3, P. 325**

Fuse-containing device simulates pyrotechnic firing circuitry. Simulator includes housing receptacle connector at one end, and fuse at opposite end. Fuse circuit useful in any system having complex built-in wiring for current pulse applications.

B84-10022
A SENSITIVE INFRARED PHOTODETECTOR
S. K. SRIVASTAVA (CALTECH) and L. MALEKI (CALTECH)
Jan. 1985
NPO-15926 **Vol. 8, No. 3, P. 325**

Technique utilizing photodetachment of negative ions incorporated into sensitive photodetector which allows detection of low-energy infrared photons, without resorting to cryogenic cooling.

B84-10023
PRECISE CONTROL OF A TUNABLE IR DIODE LASER
R. T. MENZIES (CALTECH) and C. W. RUTLEDGE (CALTECH)
Jan. 1985
NPO-16000 **Vol. 8, No. 3, P. 326**

Tuning system applicable to lead-salt semiconductor tunable diode laser (TDL) and other solid-state lasers with temperature and current dependent emission wavelength developed for balloon borne, highresolution spectrometer that measures trace atmospheric constituents in stratosphere. Instrument measures absorption at approximately 20 points in 100 MHz wide spectral line.

B84-10024
TUBE-WALL THICKNESS DETECTOR
R. E. KLEINT (Rockwell International Corp.) and R. D. BAILY (Rockwell International Corp.)
Jan. 1985
MFS-19741 **Vol. 8, No. 3, P. 326**

Eddy-current measurements detect wear of thin walls (0.01 in) (0.25 mm) in small diameter (0.19 in) (5 mm) heat exchanger tubing. Flexible durable thin rod inserts eddy-current coil into the heat exchanger tube.

B84-10025
TWIST-FREE WIRE STRANDING
R. W. HINES (Honeywell, Inc.)
Jan. 1985
MFS-25914 **Vol. 8, No. 3, P. 326**

Device for wire-stranding operations provides uniform tension and twist-free conditions for 30 gage or smaller high strand density flexible cable assemblies.

B84-10225
HIGH-FREQUENCY, HIGH-POWER CAPACITOR
C. W. WHITE (Maxwell Laboratories, Inc.) and P. S. HOFFMAN (Maxwell Laboratories, Inc.)
Apr. 1985 See Also NASA CR-168035(N83-27127/NSP)
LEW-14034 **Vol. 8, No. 4, P. 445**

Capacitor increases efficiency of high-frequency circuits. High-power-capacitor design uses split foil and floating foil plus multiple coils to reduce voltage drop across film and increases lifetime (10 years). Capacitor reliably operates at high frequency in environments normally not hospitable to electronic components.

B84-10226
STABLE OPTOCOUPLER
D. J. GRIFFIN (Perkin-Elmer Corporation)
Apr. 1985
MFS-25927 **Vol. 8, No. 4, P. 446**

Circuit stabilizes current-transfer ratio (CTR) of optically coupled isolator used as linear transducer. New circuit employs feedback circuit containing second optocoupler. Circuit is inexpensive, requires little additional hardware.

B84-10227
REVERSING OPTICAL DAMAGE IN LINBO3 SWITCHES
C. M. GEE (Hughes Aircraft Co.) and G. D. THURMOND (Hughes Aircraft Co.)
Apr. 1985
NPO-16239 **Vol. 8, No. 4, P. 447**

One symptom of optical damage in Ti-diffused LiNbO3 directional-coupler switch reversed by temporarily raising input illumination to higher-thannormal power level. Healing phenomenon used to restore normal operation, increase operating-power rating, and stabilize operating characteristics at lower powers. Higher operating power is tolerated after treatment.

B84-10228
REAL-TIME REED-SOLOMON DECODER
C. R. LAHMEYER (CALTECH)
Apr. 1985
NPO-15982 **Vol. 8, No. 4, P. 448**

RS decoder uses dedicated hardware and data pipelining for high-speed operation. Parallel processing techniques provide equivalent of over one billion operations per second at one step in decoding. Decoder finds commercial application in data encoding/decoding, telemetry, and radio communications.

B84-10229
ADVANCED DC-TRACTION-MOTOR CONTROL SYSTEM
O. VITTONE (Centro Ricerche Fiat S.p.A.)
Apr. 1985
NPO-16118 **Vol. 8, No.4, P. 449**

Motor-control concept for battery-powered vehicles includes stateof-the-art power-transistor switching and separate excitation of motor windings in traction and regenerative braking. Switching transistors and other components of power-conditioning subsystem operate under control of computer that coordinates traction, braking, and protective functions.

B84-10230
INTEGRATED LASER AND LIGHT DETECTOR
J. KATZ (CALTECH), J. R. LESH (CALTECH), and R. M. DICKINSON (CALTECH)
Apr. 1985
NPO-15943 **Vol. 8, No. 4, P. 450**

Proposed infrared optical transmitter tracks distant beacon and automatically point transmitted beam toward beacon. Essential transmitter is integrated gallium arsenide device containing electronically-steerable semiconductor injection laser and position detector that senses direction to beacon. With satisfactory optics and sufficient power, system used for long-distance transmission.

B84-10231
DIFFERENTIAL-COIL EDDY-CURRENT MATERIAL SORTER
J. NUMMELIN (Rockwell International Corp.) and D. BUCKLEY (Rockwell International Corp.)
Apr. 1985
MFS-19872 **Vol. 8, No. 4, P. 451**

Small metal or other electrically conductive parts of same shape but different composition quickly sorted with differential-coil eddy-current sorter. Developed to distinguish between turbine blades of different alloys, hardnesses, and residual stress, sorter generally applicable to parts of simple and complex shape.

B84-10232
HIGH-CYCLE-LIFE LITHIUM CELL
S. P. S. YEN (CALTECH), B. CARTER (CALTECH), D. SHEN (CALTECH), and R. SOMOANO (CALTECH)
Apr. 1985
NPO-15921 **Vol. 8, No. 4, P. 451**

Lithium-anode electrochemical cell offers increased number of charge/ discharge cycles. Cell uses components selected for compatibility with electrolyte solvent: These materials are wettable and chemically stable. Low vapor pressure and high electrochemical stability of solvent improve cell packaging, handling, and safety. Cell operates at modest temperatures less than 100 degrees C - and is well suited to automotive, communications, and other applications.

B84-10233
DISCRIMINATOR AIDS PHASE-LOCK ACQUISITION
L. M. CARSON (Motorola, Inc.) and F. E. KRASIN (Motorola, Inc.)
Apr. 1985
NPO-14311 **Vol. 8, No. 4, P. 453**

Voltage-controlled oscillator in suppressed-carrier detector acquire carrier frequency and phase quickly with help of frequency-discriminator arrangement. To obtain discriminator function, filter bandwidth in quadrature (Q) leg of detector is widened with respect to bandwidth of filter in inphase (I) leg.

B84-10234
LIGHT-ACTIVATED MICROWAVE DEVICE
J. MASERJIAN (CALTECH)
Apr. 1985
NPO-16112 **Vol. 8, No. 4, P. 453**

Laser-activated microwave semiconductor device switches at microwave speeds, generates pulses, or detects optical pulses with fast response. Device consists essentially of back-to-back metal/thin oxide/silicon (MTOS) capacitors on silicon chip.

B84-10235
MAGIC-T-COUPLED MAGNETRONS
R. M. DICKINSON (CALTECH)
Apr. 1985
NPO-15061 **Vol. 8, No. 4, P. 454**

Outputs of two magnetrons added coherently in scheme based on resonant waveguide coupling and injection phase locking. In addition, filaments are turned off after starting. Overall effect is relatively-inexpensive, lowpower, noisy magnetrons generate clean carrier signals of higher power that ordinarily require more expensive klystrons.

B84-10236
LIGHTWEIGHT REGULATED POWER SUPPLY
C. W. MCLYMAN (CALTECH)
Apr. 1985
NPO-15977 **Vol. 8, No. 4, P. 455**

Power-supply circuit regulates output voltage by adjusting frequency of chopper circuit according to variations. Currently installed in battery charger for electric wheelchair, circuit is well suited to other uses in which light weight is important - for example, in portable computers, radios, and test instruments.

B84-10237
ANTENNA SUBREFLECTOR FED BY A LINE SOURCE
A. C. BROWN JR. (Goodyear Aerospace Corp.) and G. D. BRUNNER (Goodyear Aerospace Corp.)
Apr. 1985
MSC-20626 **Vol. 8, No. 4, P. 456**

Additional antenna design options made available by subreflector concept for converting cylindrical waves into spherical waves. Waves used to feed main reflector that shapes radiation pattern into pencil beam for point-to-point communication or into fan beam for aircraft tracking, space surveillance, or directional beacon transmission.

B84-10238
ELLIPSOIDAL BALLOON ANTENNA
P. W. CRAMER (CALTECH)
Apr. 1985
NPO-15931 **Vol. 8, No. 4, P. 457**

Direct-broadcast ellipsoidal antenna 40 percent smaller than spherical reflector. Balloon antenna has feedpoint on surface of ellipsoid outside balloon, simplifying balloon deployment and feed support. Dielectric shrouds used locally to adjust shape of balloon and maintain feed distance at its optimum value.

B84-10239
EFFICIENT REFLECTOR ANTENNA
D. A. BATHKER (CALTECH), A. G. CHA (CALTECH), V. GALINDO (CALTECH), and H. F. REILLY (CALTECH)
Apr. 1985
NPO-16262 **Vol. 8, No. 4, P. 458**

Efficient antenna applicable to systems where main reflector diameter is at least 500 wavelengths. Design provides 2-to-3-dB improvement in gain divided by noise temperature (G/T) over centerline symmetric designs. Performance improvement largely due to clear-aperture, off-axis dual-reflector design.

B84-10240
MEASURING THE CONTACT RESISTANCES OF PHOTOVOLTAIC CELLS
D. R. BURGER (CALTECH)
Apr. 1985
NPO-16168 **Vol. 8, No. 4, P. 459**

Simple method devised to measure contact resistances of photovoltaic solar cells. Method uses readily available equipment and applicable at any time during life of cell. Enables evaluation of cell contact resistance, contact-end resistance, contact resistivity, sheet resistivity, and sheet resistivity under contact.

B84-10241
ESTIMATION OF GROUNDING-STRAP RESISTANCES
R. Q. JACKSON (Rockwell International Corp.)
Apr. 1985
MSC-20694 **Vol. 8, No. 4, P. 460**

Two formulas and set of tabulated values used for calculations of resistances of electrical grounding straps. Tabulated values take into account resistances of terminal crimps as well as resistance of straps alone. Equations apply to thin metal strips, woven braids, and stranded jumpers.

B84-10242
MEASURING AIR-IONIZER OUTPUT
J. O. LONBORG (CALTECH)
Apr. 1985
NPO-16058 **Vol. 8, No. 4, P. 461**

Test apparatus checks ion content of airstream from commercial air ionizer. Apparatus ensures ion output is sufficient to neutralize static charges in electronic assembly areas and concentrations of positive and negative ions are balanced.

B84-10243
GUARD FOR FUSE CAPS
D. C. ATWELL (McDonnell Douglas Corp.)
Apr. 1985
KSC-11283 **Vol. 8, No. 4, P. 461**

L-shaped guard attached to fuse holder. Guard prevents casual tampering with fuses in electrical junction box or fuse block. Protects fuses from being damaged by handling or by rope or string used to secure them. With fuse-cap guard, only responsible people have access to fuses.

B84-10244
BATTERIES FOR ELECTRIC VEHICLES
R. A. CONOVER (CALTECH)
Apr. 1985

NPO-15142 **Vol. 8, No. 4, P. 462**

Report summarizes results of test on 'near-term' electrochemical batteries - (batteries approaching commercial production). Nickel/iron, nickel/zinc, and advanced lead/acid batteries included in tests and compared with conventional lead/acid batteries. Batteries operated in electric vehicles at constant speed and repetitive schedule of accerlerating, coasting, and braking.

B84-10245
THEORETICAL INVESTIGATION OF DIELECTRIC HORN ANTENNAS
J. K. RAINES (Raines Engineering)
Apr. 1985
GSC-12876 **Vol. 8, No. 4, P. 462**

Mathematical model applicable to both solid and hollow dielectric horn antennas implemented in computer program. Conventional hollow metal horns have several disadvantages: difficult to fabricate at short wavelenghts and conducting properties of metal tend to deteriorate with increasing frequency. Dielectric horns offer advantages over conventional metal horns. Computer program permits user to investigate potential of various dielectric antenna designs.

B84-10246
REDUCING STEPPING-MOTOR POWER CONSUMPTION
C. J. WILLIAMS (The Perkin Elmer Corporation)
Apr. 1985
MFS-25119 **Vol. 8, No. 4, P. 463**

Direct-current stepping motors used in computer peripherals, process control, and precision remote-positioning equipment constantly dissipate power and create heat even when not moving. Circuit design energizes stepper motor only when pulses are present on control input.

B84-10247
DETECTING THE POLARITY OF LIGHTNING STRIKES
R. L. GRUMM (CALTECH)
Apr. 1985
NPO-16063 **Vol. 8, No. 4, P. 463**

Recording technique using audio tape recorder determines polarity of lightning discharges. Information important in design of lightning-protection equipment for powerlines and other exposed systems.

B84-10248
CALCULATING STRAIN RELIEF IN ELECTRONIC-COMPONENT LEADS
H. SNYTSHEUVEL (TRW, Inc.)
Apr. 1985
MSC-20416 **Vol. 8, No. 4, P. 463**

Stress/strain formulas applicable to design of electronic-component leads compiled in report. Such things as factors of safety and whether or not lead is likely to fail in service determined in advance. Set of formulas is simple enough to be solved on programable hand-held calculator.

B84-10249
TEMPERATURE COMPENSATION FOR A FREQUENCY-MODULATED OSCILLATOR
R. H. HESSE (TRW, Inc.)
Apr. 1985
MSC-20556 **Vol. 8, No. 4, P. 463**

Carrier frequency and deviation ratio of frequency-modulated oscillator maintained nearly constant by temperature-compensating circuit.

B84-10250
SOLID-STATE LATCHING RELAY
C. W. MCLYMAN (CALTECH)
Apr. 1985
NPO-15028 **Vol. 8, No. 4, P. 464**

Latching relay requiring only single coil activated by trigger pulse and remains latched for timed interval during which it is immune to additional trigger pulses and noise.

B84-10251
PULSED-CURRENT TRANSDUCERS
S. S. NAGANO (CALTECH)
Apr. 1985
NPO-14048 **Vol. 8, No. 4, P. 464**

Diode circuit linearizes output of pulsating dc tranducers. Circuit consists of diode in series with sensing resistor placed across secondary winding of transducer transformer.

B84-10252
PLATINUM-RESISTOR DIFFERENTIAL TEMPERATURE SENSOR
R. B. KOLBLY (CALTECH) and M. J. BRITCLIFFE (CALTECH)
Apr. 1985
NPO-15666 **Vol. 8, No. 4, P. 464**

Platinum resistance elements used in bridge circuit for measuring temperature difference between two flowing liquids. Temperature errors with circuit are less than 0.01 degrees C over range of 100 degrees C.

B84-10253
DETERMINING THE LIFE EXPECTANCY OF PHOTOVOLTAIC SYSTEMS
A. R. HOFFMAN (CALTECH), J. S. GRIFFITH (CALTECH), and P. JAFFE (CALTECH)
Apr. 1985
NPO-15683 **Vol. 8, No. 4, P. 464**

Several tests used to determine adequacy of photovoltaic systems, their modules, and materials to survive in real environments. Tests include outdoor testing of systems, real-time and accelerated outdoor testing of modules and materials, and laboratory testing of modules and materials.

B84-10254
IMPROVED OPTICAL KEYBOARD
R. S. JAMIESON (CALTECH)
Apr. 1985
NPO-15132 **Vol. 8, No. 4, P. 464**

Optical keyboard surfaces used in typewriters, computer terminals, and telephone inexpensively fabricated using stack of printed-circuit cards set in laminate. Internal laminations carry all illuminating and sensing light conductors to keys.

B84-10255
HALL-EFFECT GROUND-FAULT INTERRUPTOR
L. OKIN (Underwriters Laboratories, Inc.)
Apr. 1985
NPO-15915 **Vol. 8, No. 4, P. 464**

Tested ground-fault interruption circuit utilizing Hall-effect device to sense differential current in magnetic core tips and opens circuit.

02 ELECTRONIC SYSTEMS

B84-10026
FAST DUAL ANALOG-TO-DIGITAL CONVERTER
D. E. WALLIS (CALTECH) and R. R. GREEN (CALTECH)
Jan. 1985
NPO-15006 **Vol. 8, No. 3, P. 329**

Unit delivers blocks of quadrature data to computer memory. Contains 105 integrated circuit packages in 19 by 3 1/2 inch (48.26 by 8.39 cm) rack mounted drawer with internal force air blower. Intended for synchronous sampling of quadrature pairs of data, samples with minimal skew (about 10 nanoseconds) using video-type high-speed sampling technology. Unit equipped for computer controlled

self-testing. Originally developed for planetary radar data-acquisition system.

B84-10027
WIRE-IDENTIFICATION INSTRUMENT
J. O. LONBORG (CALTECH)
Jan. 1985
NPO-15633 **Vol. 8, No. 3, P. 330**
Instrument automatically tests each wire in multiwire cable and identifies specified wire to be segregated or labeled and locates wire connected to specified connector pin. Instrument made with readily available CMOS integrated circuits. More efficient and reliable than conventional continuity testers and less expensive than computer controlled units.

B84-10028
AUTOMATIC MONITORING OF SWITCHING POWER SUPPLIES
R. L. MOSER (Martin Marietta Corp.)
Jan. 1985
MFS-25968 **Vol. 8, No. 3, P. 351**
Fast analysis of switching waveforms allows detection of impending failures. Switching power conditioner converts dc power from source such as battery or solar cell array to well regulated dc at convenient voltages and currents. Concept originally developed for space stations and spacecraft also suitable for power conditioning equipment in aircraft and in terrestrial photovoltaic power systems.

B84-10029
INTERCOMPUTER COMMUNICATION LINK
W. A. LUSHBAUGH (CALTECH) and J. W. LAYLAND (CALTECH)
Jan. 1985
NPO-13446 **Vol. 8, No. 3, P. 331**
Interface units transmit, receive, and perform 'handshaking' functions. Two computers communicate over distance up to 6700 meters at average transmission speeds around 200 kilobaud with help of pair of programable interface units. Interfaces use form of pulse modulation and are programed for full 'handshaking' capabilities.

B84-10030
OPTICAL QUANTUM RECEIVER FOR BINARY SIGNALS
V. A. VILNROTTER (CALTECH)
Jan. 1985
NPO-15122 **Vol. 8, No. 3, P. 332**
In quantum optical receiver, both amplitude and phase of received optical signal measured to extract as much information as possible, thereby reducing error probability. Phase-modulated received signal mixed with equal amplitude replica of optical carrier generated in phase locked loop. Two signals interfere with each other at photomultiplier cathode. Probability of error with this scheme close to theoretical minimum and implemented with current technology.

B84-10031
MONITORING PERFORMANCE OF COMPLEX SYSTEMS
W. F. THOMAS
Jan. 1985
KSC-11273 **Vol. 8, No. 3, P. 333**
33-page report describes use of computers in automatic on-line monitoring of Centaur rocket prior to launch. Computers analyze measurements and verify events and commands. System uses adaptive software so only real problems are detected and brought to attention of engineers. Software techniques transferable to such industrial uses as batch process control and production line automation.

B84-10032
REPORT ON SATELLITE RADAR FOR DETECTING OCEAN CURRENTS
A. JAIN (CALTECH)
Jan. 1985
NPO-15704 **Vol. 8, No. 3, P. 333**
Good resolution and high signal/noise ratio anticipated. Report describes orbiting sidelooking radar that measures ocean currents in direction toward or away from it. Radar relies on relationship between Doppler shifts and lengths and frequencies of ocean waves.

B84-10033
COST AND PERFORMANCE OF DISTRIBUTED PHOTOVOLTAIC SYSTEMS
C. S. BORDEN (CALTECH) and M. C. DAVISSON (CALTECH)
Jan. 1985
NPO-16001 **Vol. 8, No. 3, P. 334**
Lifetime Cost and Performance (LCP) model assists in design of Photovoltaic (PV) systems. LCP simulation of performance, cost and revenue streams associated with distributed PV power systems. Provides user with substantial flexibility in specifying technical and economic environment of PV application.

B84-10034
ELECTRIC/HYBRID VEHICLE SIMULATION
R. A. SLUSSER (CALTECH), C. P. CHAPMAN (CALTECH), and J. P. BRENNAND (General Research Corp.)
Jan. 1985
NPO-15229 **Vol. 8, No. 3, P. 334**
ELVEC computer program provides vehicle designer with simulation tool for detailed studies of electric and hybrid vehicle performance and cost. ELVEC simulates performance of user-specified electric or hybrid vehicle under user specified driving schedule profile or operating schedule. ELVEC performs vehicle design and life cycle cost analysis.

B84-10035
LRU VOLTAGE ANALYSIS
T. OEPOMO (Rockwell International Corp.) and T. PROUTY (Rockwell International Corp.)
Jan. 1985
MSC-20699 **Vol. 8, No. 3, P. 335**
Program for analyzing line replacement unit (LRU) voltages in shuttle orbiter predicts minimum voltage level of main power distribution bus needed to meet predetermined LRU voltage. Loads constant-power or resistive. In some cases fed from two or three sources through diodes.

B84-10036
FRONT-END PROGRAM FOR SYSGEN
C. R. CARLSON (CALTECH) and M. DAVISSON (CALTECH)
Jan. 1985
NPO-15782 **Vol. 8, No. 3, P. 335**
SYSGEN, Power Generation System Production costing and Reliability Analysis program, simulates production costs and reliability of electric utility with and without time-dependent generating units. FEPS transforms inputs into proper formats, builds data files and adds Job Control Language necessary to running SYSGEN program.

B84-10037
MULTIPLE-USER ADAPTIVE-ARRAY COMMUNICATION SYSTEM
S. ZOHAR (CALTECH)
Jan. 1985
NPO-15765 **Vol. 8, No. 3, P. 335**
Weights for K-beam system computed K/6 times faster. In single-frequency adaptive-array communication system in whick K mobile users communicate with central station equipped with n-antenna array. Each K signal recoverable by taking specific weighted sum of n complex antenna voltages.

B84-10038
CAPACITOR-TEST SYSTEM
F. M. OTT (CALTECH) and R. A. SUMMERS (CALTECH)
Jan. 1985
NPO-16485 **Vol. 8, No. 3, P. 336**

Polycarbonate film capacitors tested for leakage paths with microprocessor controlled multiplexer test sequence. Microprocessor based capacitor test system simultaneously monitors 80 capacitors.

B84-10039
IMPROVED ULTRASONIC RESOLUTION VIA ANALOG TECHNIQUE
P. M. GAMMELL (CALTECH)
Jan. 1985
NPO-15707 **Vol. 8, No. 3, P. 336**
High spatial resolution obtained from reflected or transmitted ultrasonic pulses by analog technique that produces signal proportional to magnitude of complex plane analytic representation of signal.

B84-10040
REMOVING DRIFT FROM FREQUENCY-STABILITY MEASUREMENTS
C. A. GREENHALL
Jan. 1985
NPO-15833 **Vol. 8, No. 3, P. 336**
Method for eliminating frequency drifts from frequency stability measurements produces more accurate indication of stability of such frequency standard as hydrogen maser.

B84-10041
REMOTE-IMAGING PARAMETERS
R. F. RICE (CALTECH)
Jan. 1985
NPO-14869 **Vol. 8, No. 3, P. 336**
Image resolution, image quality and data transmission rate of remote imaging systems continuously controlled by operator intervention. Set of levers allows operator to control independently frame rate, frame size and image quality in bits per pixel. System used for imaging systems in aircraft or remotely piloted vehicles.

B84-10042
PROGRAMABLE MULTICRATE CONTROLLER
G. L. MOOK (McDonnell Douglas Corp.) and M. R. PHILLIPS (McDonnell Douglas Corp.)
Jan. 1985
MFS-25533 **Vol. 8, No. 3, P. 336**
High-speed, environmentally hardened controller developed for use with commercially available system crates for both experiment control and data handling. Programable crate controller consists of three functional areas: control section utilizes high-speed bit-slice circuitry, memory, and data way interface.

B84-10043
EYE-MOVEMENT TRACKER WOULD REDUCE VIDEO BANDWIDTH
C. F. RUOFF (CALTECH)
Jan. 1985
NPO-15432 **Vol. 8, No. 3, P. 337**
Bandwidth required to transmit closed circuit television image reduced by transmitting small portion at high resolution and remainder at low resolution. High-resolution portion centered in viewer's gaze so entire image seems to be of high resolution.

B84-10044
ELIMINATING FALSE SIGNALS FROM ELECTROMECHANICAL KEYBOARDS
C. F. SCHOTT (Rockwell International Corp.)
Jan. 1985
MSC-20429 **Vol. 8, No. 3, P. 337**
Contact switches in electromechanical keyboards prone to 'bounce' creation of unwanted pulses that interfere with digital systems. New adapter unit eliminates bounce without separate power supply.

B84-10045
LOW-FREQUENCY NAVIGATIONAL SYSTEM
D. E. WALLIS (CALTECH)
Jan. 1985
NPO-15264 **Vol. 8, No. 3, P. 337**
Accurate vehicle position determination over 50 by 50-km service area accomplished by low-frequency-radio navigational system comprised of four frequency/phase comparison transmitters and receivers. Use of grid-calibration table permits accurate position determination in vehicle receiver system.

B84-10046
TRANSFER-FUNCTION SIMULATOR
M. J. KAVAYA (CALTECH)
Jan. 1985
NPO-15696 **Vol. 8, No. 3, P. 337**
Transfer function simulator constructed from analog or both analog and digital components substitute for device that has faults that confound analysis of feedback control loop. Simulator is substitute for laser and spectrophone.

B84-10047
OPTICAL MASS MEMORY SYSTEM SPECIFICATION
Innovator Not Given (Harris Corp.) Jan. 1985
MFS-25592 **Vol. 8, No. 3, P. 337**
Specifications given for computer controlled optical mass memory system that stores and retrieves data from silver halide fiches 148-mm square and 7 mils (0.18mm) thick at user bit density of 30 Mbit/in. 2 (4.7 Mbit/cm2) with uncorrectable bit-error rate of 10 to negative 9th power or less. Allows for expansion to 10 the 15th power bit capacity.

B84-10048
REED-SOLOMON ENCODER
T. K. TROUNG (CALTECH), I. S. REED (CALTECH), L. J. DEUTSCH (CALTECH), I. S. HSU (CALTECH), K. WANG (CALTECH), and C. S. YEH (CALTECH)
Jan. 1985
NPO-16074 **Vol. 8, No. 3, P. 337**
Report presents mathematical principles of Berlekamp bit serial multiplier algorithm and its application to design of very-large-scale integrated (VLSI) encoders for Reed-Solomon error-correcting codes. Structure made readily on single chip of negatively doped channel metal oxide semiconductor.

B84-10049
NORMALIZING VFO FREQUENCY BY NON-POWR-OF-2 DIVISION
C. R. ANDERSON (Odetics, Inc.)
Jan. 1985
NPO-15330 **Vol. 8, No. 3, P. 338**
PLL oscillator with VFO operating at one frequency yields any one of four frequencies by dividing by 4, 7, 21, or 52.5. Radiation resistant phase-locked loop oscillator generates output frequency 32 times any 1 or 4 specific input reference frequencies constructed without increasing component count over that of conventional circuit.

B84-10256
DIRECT-PHOTON-DETECTION COMMUNICATIONS
J. R. LESH (CALTECH) and J. KATZ (CALTECH)
Apr. 1985
NPO-15905 **Vol. 8, No. 4, P. 467**
Optical communications system based on direct detection of photons rather than heterodyning of carrier with local oscillator. Direct-detection system uses single laser source, pulse-position modulation, and Reed-Solomon coding to protect against burst errors. Conventional photomultiplier tube is receiver. Technology applicable to terrestrial communications.

B84-10257
ESTIMATES OF SMALL SIGNAL/NOISE RATIOS
L. D. HOWARD (CALTECH)
Apr. 1985
NPO-15653 **Vol. 8, No. 4, P. 468**

Signal/Noise Ratio Meter measures ratio of signal power to noise power in input that contains both signal and noise. Signal and noise first filtered and normalized in analog circuitry, then digitized and sampled. Performance of SNR meter determined by statistical algorithm chosen for analysis of samples.

B84-10258
PROXIMITY INDICATOR FOR REMOTE MANIPULATOR
A. K. BEJCZY (CALTECH)
Apr. 1985
NPO-15064 **Vol. 8, No. 4, P. 468**

Display indicates pitch, yaw, and distance of remote manipulator with respect to object to be grasped. Displays numerical values and bargraph simulation of position and orientation of hand. When errors in position and orientation are small enough to ensure successful grasp, unit alerts operator with audible and visible signals.

B84-10259
CONTROLLING SOLAR-POWER SYSTEMS WITH DISTRIBUTED PROCESSORS
M. S. IMAMURA (Martin Marietta Corp.) and R. L. MOSER (Martin Marietta Corp.)
Apr. 1985
NPO-15101 **Vol. 8, No. 4, P. 469**

System undergoing development uses distributed microprocessors to monitor and control photovoltaic power system. Equipment increases life expectancy and reliability of power system and decreases costs. Adapted to vehicular, residential, and commercial solar and nonsolar power systems. Equipment especially desirable in systems with overall power levels above few kilowatts.

B84-10260
MEASURING TRACKING ACCURACY OF CCD IMAGERS
R. H. STANTON (CALTECH) and E. W. DENNISON (CALTECH)
Apr. 1985
NPO-15665 **Vol. 8, No. 4, P. 470**

Tracking accuracy and resolution of charge-coupled device (CCD) imaging arrays measured by instrument originally developed for measuring performance of star-tracking telescope. Operates by projecting one or more artificial star images on surface of CCD array, moving stars in controlled patterns, and comparing star locations computed from CCD outputs with those calculated from step coordinates of micropositioner.

B84-10261
PRIORITY QUEUING ON A PARALLEL DATA BUS
D. E. WALLIS (CALTECH)
Apr. 1985
NPO-15005 **Vol. 8, No. 4, P. 471**

Queuing strategy for communications along shared data bus minimizes number of data lines while always assuring user of highest priority given access to bus. New system handles up to 32 user demands on 17 data lines that previously serviced only 17 demands.

B84-10262
TARGET SIMULATOR FOR SYNTHETIC-APERTURE RADARS
H. A. ZEBKER (CALTECH), D. N. HELD (CALTECH), R. M. GOLDSTEIN (CALTECH), and T. C. BICKLER (CALTECH)
Apr. 1985
NPO-15024 **Vol. 8, No. 4, P. 471**

In proposed Target Simulator for Testing Synthetic-Aperture Radars, radar transmitter output received, mixed down to video frequencies, and passed through variable digital delay. Delayed signal mixed up to original carrier frequency and transmitted back to radar. Synthetic-aperture radar (SAR) generates return signal that contains range-curvature information in addition to Doppler-frequency information.

B84-10263
SYNCHRONIZED RADAR-TARGET SIMULATOR
B. C. CHIN (Hughes Aircraft Co.)
Apr. 1985
MSC-20240 **Vol. 8, No. 4, P. 472**

Apparatus for testing radar system generates signals that simulate amplitude and phase characteristics of target returns and their variation with antenna-pointing direction. Antenna movement causes equipment to alter test signal in imitation of behavior of real signal received during tracking.

B84-10264
ESTIMATING DOPPLER SHIFTS FOR SYNTHETIC-APERTURE RADAR
J. C. CURLANDER (CALTECH)
Apr. 1985
NPO-15990 **Vol. 8, No. 4, P. 473**

Quality of synthetic-aperture-radar (SAR) imagery enhanced by pair of signal-processing techniques that compensate for relative motion between target and vehicle. Combining vehicle trajectory data with radar-parameter and raw image data, techniques generate Doppler estimates for use in constructing fully processed images.

B84-10265
CONTOUR-MAPPING SYNTHETIC-APERTURE RADAR
R. M. GOLDSTEIN (CALTECH), E. R. CARO (CALTECH), and C. WU (CALTECH)
Apr. 1985
NPO-15939 **Vol. 8, No. 4, P. 474**

Airborne two-antenna synthetic-aperture-radar (SAR) interferometric system provides data processed to yield terrain elevation as well as reflectedintensity information. Relative altitudes of terrain points measured to within error of approximately 25 m.

B84-10266
FIBER-OPTIC EQUIPMENT FOR POWER-SYSTEM CONTROL
A. O. BRIDGEFORTH (CALTECH) and L. C. YANG (CALTECH)
Apr. 1985
NPO-15968 **Vol. 8, No. 4, P. 476**

Report surveys state of art in fiber optics and explores use of microprocessors communicating over optical fibers to control complicated power system with many producing and consuming units. Power system of study is of planetary spacecraft, and fiber-optic technology extension of that now under development or used in military aircraft and ships.

B84-10267
CONVOLUTIONALLY-CODED UNBALANCED QPSK SYSTEMS
D. DIVSALAR (CALTECH) and J. H. YUEN (CALTECH)
Apr. 1985
NPO-15566 **Vol. 8, No. 4, P. 476**

Report discusses error-rate performance for three convolutionally coded unbalanced quadriphase-shift-keying (UQPSK) communication systems with noisy carriers that introduce crosstalk. Systems analyzed unbalanced in sense that each transmits two data streams with different bit rates and (in some cases) different powers.

B84-10268
INTERACTIVE DIGITAL SIGNAL PROCESSOR
W. H. MISH
Apr. 1985
GSC-12862 **Vol. 8, No. 4, P. 477**

Interactive Digital Signal Processor, IDSP, consists of set of time series analysis 'operators' based on various algorithms commonly used for digital signal analysis. Processing of digital signal time series to extract information usually achieved by applications of number of fairly standard operations. IDSP excellent teaching tool for demonstrating application for time series operators to artificially generated signals.

B84-10269
SHORT-RANGE DIGITAL OPTICAL LINKS
R. M. DICKINSON (CALTECH)
Apr. 1985
NPO-15999 **Vol. 8, No. 4, P. 477**
Concept based on multiple optoelectronic chips. Proposed network of semiconductor lasers used for communication and radar. Network includes small integrated transmitters, receivers, and data processors placed at strategic points on station and vehicles.

B84-10270
COMMUNICATION PROGRAM EMULATES SWITCHBOARD
D. RON (Rockwell International Corp.)
Apr. 1985
MFS-19917 **Vol. 8, No. 4, P. 477**
Software allows microprocessor systems to communicate with external devices. Flexible program completely menu-driven, and all local operator commands require only single keystroke.

B84-10271
DIGITAL RATIOMETER
R. BEER
Apr. 1985
NPO-15396 **Vol. 8, No. 4, P. 477**
Small, low-cost comparator with 24-bit-precision yields ratio signal from pair of analog or digital input signals. Arithmetic logic chips (bit-slice) sample two 24-bit analog-to-digital converters approximately once every millisecond and accumulate them in two 24-bit registers. Approach readily modified to arbitrary precision.

B84-10272
BISTATIC SYNTHETIC-APERTURE RADAR
C. ELACHI (CALTECH), R. GOLDSTEIN (CALTECH), and D. HELD (CALTECH)
Apr. 1985
NPO-15619 **Vol. 8, No. 4, P. 478**
Report describes synthetic-aperture radar that uses spaceborne transmitter and ground (or airborne) receiver to obtain imaging data in real time. System has applications in vessel navigation in open seas and polar ice regions, monitoring of wave and ice patterns near shores and oil platforms, and continuous monitoring of region with repeat time of few hours or less.

B84-10273
IMAGING SYSTEM FOR HIGH-TEMPERATURE PROCESSES
T. A. GLAVICH (CALTECH)
Apr. 1985
NPO-15945 **Vol. 8, No. 4, P. 478**
Borescope/camera arrangement used for viewing silhouette image of specimen levitated inside furnance. System adapted for monitoring other processes in enclosures.

B84-10274
QUICKER SELECTION OF CCD IMAGES
P. M. SALOMON (CALTECH) and K. SMILOWITZ (CALTECH)
Apr. 1985
NPO-15345 **Vol. 8, No. 4, P. 478**
Microprocessor limits analog-to-digital conversion to image areas of interest. Image region of interest selected in order of brightness by use of threshold detectors and their coordinates stored by microprocessor for tracking.

B84-10275
HIGH-RESOLUTION CHARGE-COUPLED-DEVICE CAMERA
M. C. CLARY (CALTECH), K. P. KLAASEN (CALTECH), L. M. SNYDER (CALTECH), and P. K. WANG (CALTECH)
Apr. 1985
NPO-15086 **Vol. 8, No. 4, P. 478**
800-by-800-element sensor and lens of 1.5-m focal length used in camera with 0.01-mrad resolution.

B84-10276
PACKET TELEMETRY AND PACKET TELECOMMAND
A. J. HOOKE (CALTECH) and E. GREENBERG (CALTECH)
Apr. 1985
NPO-16301 **Vol. 8, No. 4, P. 478**
Two communication protocols for telemetry and telecommand reduce amount of required hardware and software and facilitate bidirectional information exchange.

03 PHYSICAL SCIENCES

B84-10050
INTERFEROMETER MEASURES BROADBAND SURFACE ACOUSTIC WAVES
R. O. CLAUS (Virginia Polytechnic Institute and State University) and T. TURNER (Virginia Polytechnic Institute and State University)
Jan. 1985
LAR-12966 **Vol. 8, No. 3, P. 341**
Dual differential interferometer uses two pairs of orthogonallypolarized optical beams to measure amplitude and orientation of broadband ultrasonic surface acoustic waves. Instrument modular, and sensitivity limited only by optical detector used.

B84-10051
ACOUSTIC GAUSSIAN FAR-FIELD PATTERN
R. O. CLAUS (Virginia Polytechnic Institute and State University) and P. S. ZERWEKH (Virginia Polytechnic Institute and State University)
Jan. 1985
LAR-12967 **Vol. 8, No. 3, P. 342**
Gaussian profile achieved by using annular electrodes. Transducer constructed by deposting circularly symmetric metallic multielectrode array on 12.7 mm diameter X-cut quartz disk. Each electrode independently connected to impedance network optimized to produce Gaussian distribution with less than 2 percent error. Ultrasonic transducer produces far field beam with Gaussian spatial profile for materials evaluation applications.

B84-10052
RECEIVER FOR SOLAR AIR TURBINE
A. KOFAL (The Boeing Co.), R. SHANNON (The Boeing Co.), and D. K. ZIMMERMAN (The Boeing Co.)
Jan. 1985
NPO-15124 **Vol. 8, No. 3, P. 343**
Solar receiver heats air to temperature high enough to drive gas turbine. Receiver has thermal output of about 70 kilowatts. Pointing downward at focal position of solar reflector, proposed receiver accepts intense concentrated sunlight. Although temperatures in receiver may rise to 1,500 degrees F (816 degrees C) or more, calculations show receiver loses less that 10 percent of insolation by convection through aperture. Receiver designed for 30-year life without scheduled maintenance or replacement.

B84-10053
ANGLE-MEASUREMENT AND RANGING SYSTEM
J. C. TIETZ (Martin Marietta Corp.)
Jan. 1985
MFS-25912 **Vol. 8, No. 3, P. 344**
Optical system automatically supplies information on

angular position and range of object. Stereo rangefinder video signals from cameras processed to determine center of brightness for images of beacon on target vehicle. Range updated by onboard computer. Originally developed for spacecraft rendezvous and guidance, features of system adapted to angle-measurement and ranging problems on Earth. Technique also used for tool alinement inspections and color recognition.

B84-10054
ZERO-NET-CHARGE AIR IONIZER
W. R. WOODS JR. (CALTECH)
Jan. 1985
NPO-15937 **Vol. 8, No. 3, P. 345**

Instrument monitors air supplied by air ionizer and regulates ionizer to ensure net charge neutral. High-impedance electrometer and nulling control amplifier regulate output of air ionizer. Primarily intended to furnish ionized air having no net charge, instrument adaptable to generating air with positive or negative net charge is so desired. Useful where integrated circuit chips are manufactured, inspected, tested or assembled.

B84-10055
CONVECTIVE OSCILLATIONS AT CRYSTAL/MELT INTERFACE
M. GLICKSMAN (Rensselaer Polytechnic Institute), S. CORIELL (National Bureau of Standards), and R. BOISVERT (National Bureau of Standards)
Jan. 1985
MFS-25892 **Vol. 8, No. 3, P. 345**

Oscillatory instability in shape of solid/liquid interface geometry observed in heat-transfer experiments in long, thin vertical cylinder filled with succinonitrile. Novel fluid flow configuration with cylindrical symmetry developed to permit detailed heat flow experiments in geometry also mathematically tractable.

B84-10056
ASSESSING ENERGY-GENERATING SYSTEMS
R. G. CHAMBERLAIN (CALTECH), K. M. MCMASTER (CALTECH), and M. C. DAVISSON (CALTECH)
Jan. 1985
NPO-16159 **Vol. 8, No. 3, P. 346**

Economics of user specified thermal and electrical systems analyzed. OMEGA finds normative prices and break-even values of system parameters. Applies to electrical and thermal energy generation systems owned by utility, business or consumer.

B84-10057
A GENERAL OPTICAL SYSTEMS EVALUATION PROGRAM
M. WILSON and B. HOWELL
Jan. 1985
GSC-12823 **Vol. 8, No. 3, P. 346**

General Optical Systems Evaluation Program, GENOPTICS, aids analysis and evaluation of optical systems that employ lenses, mirrors, diffraction gratings and other geometrical surfaces. GENOPTICS uses geometrical ray tracing based on Snell's law.

B84-10058
SOLAR/THERMAL POWERPLANT SIMULATION
J. M. BOWYER (CALTECH), N. EL GABALAWI (CALTECH), G. M. HILL (CALTECH), and M. L. SLONSKI (CALTECH)
Jan. 1985
NPO-15440 **Vol. 8, No. 3, P. 347**

Simulation program evaluates performances and energy costs of diverse solar/thermal powerplant configurations. Approach based on optimizing sizes of collector and storage subsystems to give minimum energy cost for specified plant rating and load factor. Methodology provides for consistent comparative evaluation of solar/thermal powerplants.

B84-10059
THERMOELECTRIC GENERATOR
T. COLE (CALTECH)
Jan. 1985
NPO-16164 **Vol. 8, No. 3, P. 347**

Small modular alkali metal thermoelectric generator with no moving parts directly converts heat to electrical energy with efficiency of 20 to 40 percent. Unit uses closed regenerative electrochemical concentration cell based on sodium-ion conductor beta alumina.

B84-10060
SOFT-X-RAY PREFILTER FOR HOT, BRIGHT OBJECTS
J. M. DAVIS (American Science & Engineering, Inc.) and J. A. ORTENDAHL (American Science & Engineering, Inc.)
Jan. 1985
NPO-15972 **Vol. 8, No. 3, P. 347**

Prefilters consisting of beryllium foil supported on conductive silver mesh transmit soft x-rays but are nearly opaque to visible and infrared light. New Be/AG filters protect imaging X-ray detectors from damage by visible and longer wavelength radiation when viewing such hot, bright emitters as Sun or possibly certain industrial processes.

B84-10061
FREQUENCY-MODULATION CORRELATION SPECTROMETER
J. S. MARGOLIS (CALTECH) and J. V. MARTONCHIK (CALTECH)
Jan. 1985
NPO-15558 **Vol. 8, No. 3, P. 347**

New type of correlation spectrometer eliminates need to shift between two cells, one empty and one containing reference gas. Electrooptical phase modulator sinusoidally shift frequencies of sample transmission spectrum.

B84-10062
PUMP-FED VERSUS PRESSURE-FED PROPULSION
P. N. ESTEY (CALTECH)
Jan. 1985
NPO-15190 **Vol. 8, No. 3, P. 348**

Pumping system has lower mass. Equations worked out to compare masses of pump and pressure-fed bipropellant propulsion systems. Equations developed specifically for interplanetary spacecraft but technique adaptable to advanced automative energy-storage techniques.

B84-10063
MONITORING OF REACTIVE ATMOSPHERIC SPECIES
C. R. WEBSTER (CALTECH)
Jan. 1985
NPO-15981 **Vol. 8, No. 3, P. 348**

Reactive atmospheric species produced and detected to provide reference spectra. Compact device insensitive to scattered light and has low power consumption.

B84-10064
THERMAL-EXPANSION MEASUREMENT
J. H. DAVIS (University of Alabama) and C. RIVES (University of Alabama)
Jan. 1985
MFS-27000 **Vol. 8, No. 3, P. 348**

Precise stable laser system determines coefficients of thermal expansion. Dual-beam interferometer arrangement monitors changes in sample length as function of temperature by following changes inoptical path lengths.

B84-10065
INTEGRATED SYSTEM FOR ENVIRONMENTAL SIMULATION
R. UDA (Planning Research Corp.), S. DANDAGE (Planning Research Corp.), and D. MACDONALD (Planning Research Corp.)
Jan. 1985
KSC-11274 **Vol. 8, No. 3, P. 348**

Integrated testing system subjects ground-support

equipment for Space Shuttle to conditions that prevail during launch. Concept also applies to testing other equipment that must function faultlessly in difficult environment.

B84-10066
FLEXIBLE MIRROR MOUNT FOR MICHELSON INTERFEROMETER
G. S. PERKINS (CALTECH)
Jan. 1985
NPO-15746 **Vol. 8, No. 3, P. 348**
Interferometer mirrors mounted on flexible spring strips. Mounts used in folded-beam Michelson interferometer designed to monitor pollutants at altitude of 40,000 meters.

B84-10067
ADJUSTABLE-FREQUENCY SPECTROPHONE LASER STABILIZATION
M. J. KAVAYA (CALTECH) and R. T. MENZIES (CALTECH)
Jan. 1985
NPO-15516 **Vol. 8, No. 3, P. 348**
Gas laser frequency stabilizing system includes sensitive spectrophone that senses dither modulation of frequency of laser beam, producing Lorentzian, Voigt, or Doppler spectral tuning response.

B84-10068
EVALUATING SOLAR COLLECTORS
L. C. WEN (CALTECH), P. T. POON (CALTECH), W. J. CARLEY (CALTECH), and L. HUANG (U.S. Navy)
Jan. 1985
NPO-15733 **Vol. 8, No. 3, P. 349**
Survey discusses several methods for assessing performance of solar-concentrator designs to determine whether given design suitable for given high-temperature solar powered generator system.

B84-10069
SOLAR-POWERED WATER DISTILLATION
F. J. MENNINGER (CALTECH) and R. J. ELDER (CALTECH)
Jan. 1985
NPO-15894 **Vol. 8, No. 3, P. 349**
Solar-powered still produces pure water at rate of 6,000 gallons per year. Still fully automatic and gravity-fed. Only outside electric power is timer clock and solenoid-operated valve. Still saves $5,000 yearly in energy costs and pays for itself in 3 1/2 years.

B84-10070
ASSESSING THE PERFORMANCE OF SOLAR ARRAYS
R. G. ROSS JR. (CALTECH) and C. C. GONZALEZ (CALTECH)
Jan. 1985
NPO-15277 **Vol. 8, No. 3, P. 349**
Selected environmental conditions more effective than traditional parameters. Report analyzes selection of reference criteria for comparing performances of photovoltaic arrays.

B84-10071
SOLAR-THERMAL-DESALINATION STUDY
L. D. LEIBOWITZ (CALTECH), T. M. LIU (CALTECH), and H. Q. PHAM (CALTECH)
Jan. 1985
NPO-15795 **Vol. 8, No. 3, P. 349**
Survey assessing economic feasibility of advanced solar-thermal technologies for desalination described in report.

B84-10072
SUPPORT SYSTEM FOR SOLAR RECEIVERS
T. KICENIUK (CALTECH)
Jan. 1985
NPO-15749 **Vol. 8, No 3, P. 349**
Hinged split-ring mounts insure safe support of heavy receivers. In addition to safer operation and damage-free mounting system provides more accurate focusing, and small incremental adjustments of ring more easily made.

B84-10073
TESTING FOR SOLAR-ARRAY HOTSPOTS
C. C. GONZALEZ (CALTECH) and J. C. ARNETT (CALTECH)
Jan. 1985
NPO-15596 **Vol. 8, No. 3, P. 350**
Laboratory procedure developed for evaluting hot-spot endurance of photovoltaic modules under field-service conditions. Procedures used for qualification testing of modules.

B84-10077
REFLECTING SCHMIDT/LITTROW PRISM IMAGING SPECTROMETER
J. B. BRECKINRIDGE (CALTECH), N. A. PAGE (CALTECH), R. V. SHACK (CALTECH), and R. R. SHANNON (CALTECH)
Apr. 1985
NPO-15801 **Vol. 8, No. 4, P. 481**
High resolution achieved with wide field of view. Imaging Spectrometer features off-axis reflecting optics, including reflecting 'slit' that also serves as field flattener. Only refracting element is prism. By scanning slit across object or scene and timing out signal, both spectral and spatial information in scene are obtained.

B84-10278
LASER RANGEFINDER AND REMOTE PROFILOMETER
J. M. MCLAUCHLAN (CALTECH), J. AUYEUNG (CALTECH), E. F. TUBBS (CALTECH), W. G. GOSS (CALTECH), and D. PSALTIS (CALTECH)
Apr. 1985
NPO-15865 **Vol. 8, No. 4, P. 482**
Proposed laser rangefinder and profilometer operates with precision of about 1mm at ranges of up to 100m. With scanning optics, device could track objects or accurately measure shapes of objects in field of view. New microprocessor-controlled design uses variable-length fiber-optic delay line as distance reference. New rangefinding method used in vision systems for industrial robots.

B84-10279
RAPID FREEZING-POINT MEASUREMENT
B. MATHIPRAKASAM (Midwest Research Institute)
Apr. 1985 See Also CR-167981 (N83-10207)
LEW-14019 **Vol. 8, No. 4, P. 483**
Technique developed for rapid determination of freezing-point temperature of fuels. Technique determines freezing point in under 10 minutes and is suitable for use in design of portable device.

B84-10280
DETERMINING THE SLOPE ERROR OF A PARABOLIC REFLECTOR
G. R. CHRIST (AAI Corporation)
Apr. 1985
NPO-15713 **Vol. 8, No. 4, P. 484**
Approximate slope error determined with minimal test equipment. Test Setup for Determining Slope Error for Point-Focusing Dish includes pinhole camera at center of curvature and color-coded target mounted around pinhole. Floodlights illuminate target to minimize exposure time. New procedure provides good approximation of reflector slope error and is excellent tool for comparative analysis of reflectors used as solar collectors for microwave receivers.

B84-10281
INTERFEROMETER FOR MEASURING ACOUSTIC SIGNALS
R. O. CLAUS (Virginia Polytechnic Institute and State University) and A. O. GARG (Virginia Polytechnic Institute and State University)
Apr. 1985

LAR-13030 **Vol. 8, No. 4, P. 484**

Optical-fiber interferometer measures wave amplitude without contacting specimen surface. System contains remote detector head. Head includes beam splitter that divides input beam and recombines output beams, while spatial filter filters interference pattern at beam-splitter output; and lens focuses this on detector. Beams focused on specimen surface to record acoustic signals.

B84-10282
ROOF OVERHANGS FOR SOLAR HOUSES
W. GRACEY
Apr. 1985
LAR-13140 **Vol. 8, No. 4, P. 485**

Convenient graphical method determines both width and vertical position of overhangs for standard wall section having 'typical' window arrangement. Overhangs for this wall section determined for two extremes of latitude in United States.

B84-10283
TELESCOPING SHIELD FOR POINT-FOCUSING SOLAR CONCENTRATORS
M. ARGOUD (CALTECH), W. WALKER (CALTECH), and L. V. BUTLER (CALTECH)
Apr. 1985
NPO-16236 **Vol. 8, No. 4, P. 486**

Telescoping shield normally stowed around solar receiver protects heat engine and supporting structure from overheating when concentrator aimed few degrees away from line to Sun. When extended, shield intercepts off center concentrated solar radiation. Heat spread out over thermally conductive shield and reradiated diffusely not to cause structural damage.

B84-10284
MAXIMUM OUTPUTS OF SOLAR PHOTOVOLTAIC ARRAYS
R. G. ROSS JR. (CALTECH), G. M. HILL (CALTECH), and C. C. GONZALEZ (CALTECH)
1985
NPO-15966 **Vol. 8, No. 4, P. 487**

Report presents electrical data for solar photovoltaic arrays operating at different locations in United States. Data useful in designing power-conditioners for matching output of array to load.

B84-10285
LASER POLLUTANT-MEASURING SYSTEMS
W. B. GRANT (CALTECH) and R. T. MENZIES (CALTECH)
Apr. 1985
NPO-16101 **Vol. 8, No. 4, P. 487**

Laser optical system for remote gas pollutant measurements surveyed. Laser systems discussed in published report, and choices of appropriate gas measuring instruments and their sensitivities evaluated.

B84-10286
RETRIEVAL OF GEOPHYSICAL PARAMETERS FROM RADIOMETRIC DATA
P. C. PANDEY (CALTECH) and R. K. KAKAR (CALTECH)
Apr. 1985
NPO-16266 **Vol. 8, No. 4, P. 487**

Rapid linear algorithm retrieves meteorological parameters from microwave radiometric data. Versatile 2-step, multiple-linear-regression algorithm examines all possible subsets of available channels and selects optimum subset for retrieving given geophysical or meteorological parameter.

B84-10287
INSTRUMENTATION FOR SOLAR-OSCILLATION MEASUREMENTS
E. J. RHODES JR. (CALTECH), T. W. ANDREWS (CALTECH), E. J. SMITH (CALTECH), R. F. HOWARD (Mount Wilson Observatory), and R. K. ULRICH (UCLA)
Apr. 1985
NPO-15687 **Vol. 8, No. 4, P. 488**

System works with any telescope with spectrograph without interfering with existing use of spectrograph. Telescope aiming accuracy is 1 arc-second.

B84-10288
SOLAR-POWER SYSTEM PRODUCES HIGH-PRESSURE STEAM
F. L. LANSING (CALTECH)
Apr. 1985
NPO-15434 **Vol. 8, No. 4, P. 488**

Combination of three multistaged solar collectors produces highpressure steam for large-scale continuously operating turbines for generating mechanical or electrical energy. Superheated water vapor drives turbines, attaining an overall system efficiency about 22 percent.

B84-10289
FRESNEL-LENS/HEAT-STORAGE SYSTEM
R. H. TURNER (CALTECH)
Apr. 1985
NPO-16242 **Vol. 8, No. 4, P. 488**

Self-contained solar-thermal power-plant uses Fresnel lenses to deliver up to 100 kilowatts. Proposed 200-volt system uses about 800 Fresnel lenses.

B84-10290
TEN THOUSAND SOLAR CONSTANTS RADIOMETER
J. M. KENDALL SR. (CALTECH)
Apr. 1985
NPO-15922 **Vol. 8, No. 4, P. 488**

'Radiometer for Accurate (+ or - 1%) Measurement of Solar Irradiances Equal to 10,000 Solar Constants,' gives additional information on radiometer described elsewhere. Self-calibrating, water-cooled, thermopile radiometer measures irradiance produced in solar image formed by parabolic reflector or by multiple-mirror solar installation.

B84-10291
HEAT STORAGE AND TRANSPORT
P. A. BAHRAMI
Apr. 1985
NPO-15468 **Vol. 8, No. 4, P. 488**

System for storing large amounts of heat per unit volume comprises encapsulated sealed pellets of phase-change materials dispersed and suspended in inert fluid-transport medium.

B84-10292
SOLAR SHUTTER
R. R. HALE (CALTECH)
Apr. 1985
NPO-15428 **Vol. 8, No. 4, P. 489**

Solar receiver turned off by movable reflective shutter. When reflective surface interposed across optical axis, incoming solar heat reflected back to concentrator for rejection into space.

B84-10293
SOLAR-HEATED GASIFIER
S. A. QADER (CALTECH)
Apr. 1985
NPO-15071 **Vol. 8, No. 4, P. 488**

Catalytic coal and biomass gasifer system heated by solar energy. Sunlight from solar concentrator focused through quartz window onto ceramic-honeycomb absorber surface, which raises temperature of reactant steam, fluidizing gas, and reactor walls.

B84-10294
POINT-FOCUSING SOLAR-POWER DISTRIBUTED RECEIVERS
J. W. LUCAS (CALTECH)
Apr. 1985
NPO-15578 **Vol. 8, No. 4, P. 489**

Two-volume annual report describes development work

aimed at achieving large-scale production of modular, point-focusing distributed receivers (PFDR's) for solar-powered generation of electricity or thermal power for industrial use.

B84-10295
PURIFICATION OF SOLAR PONDS
S. CARPENTER
Apr. 1985
NPO-15397 **Vol. 8, No. 4, P. 489**
Flocculatory agents added to solar saltponds remove turbidity to increase solar-energy collection efficiency. Flocculating agent or bacteriocide used to remove microorganisms sprayed onto pond from airplane and allowed to settle to bottom of pond.

B84-10296
A CERAMIC HEAT EXCHANGER FOR SOLAR RECEIVERS
C. ROBERTSON JR. (General Electric Co.) and L. STACY (General Electric Co.)
Apr. 1985
NPO-15771 **Vol. 8, No. 4, P. 489**
Design intended for high-temperature service. Proposed ceramic-tube and header heat exchangers used for solar-concentrating collector operating in 25- to 150-KW power range at temperatures between 2,000 degrees and 3,000 degrees F (1,095 degrees and 1,650 degrees C).

B84-10297
CALIBRATING FOR IONOSPHERIC PHASE DELAYS
P. F. MACDORAN (CALTECH)
Apr. 1985
NPO-15430 **Vol. 8, No. 4, P. 489**
Technique determines ionospheric phase delay on real-time universally applicable basis in terms of electrons per meter squared by coherently modulating two L-band carrier frequencies received from two Global Positioning System satelites. Two pseudorandom number sequences cross-correlated to derive delay time.

B84-10298
GENERAL DESIGN CONSIDERATIONS FOR REMOTE SENSORS
F. C. BILLINGSLEY (CALTECH)
Apr. 1985
NPO-15930 **Vol. 8, No. 4, P. 490**
Report discusses design of orbiting remote sensors. Needs of users considered in light of satellite capabilities. Multiple-resolution sensor satisfies several disciplines otherwise competing for spatial and spectral resolution.

B84-10299
ELECTRON-ATTACHMENT PROFILES
A. CHUTJIAN and J. M. AJELLO
Apr. 1985
NPO-14865 **Vol. 8, No. 4, P. 490**
Report available that describes technique of photoelectron spectroscopy to measure shapes of threshold electron-attachment cross sections of various gases.

B84-10300
COMPOSITE SPECTROMETER PRISMS
J. B. BRECKINRIDGE (CALTECH), N. A. PAGE (CALTECH), and J. M. RODGERS (University of Arizona)
Apr. 1985
NPO-16060 **Vol. 8, No. 4, P. 490**
Efficient linear dispersive element for spectrometer instruments achieved using several different glasses in multiple-element prism. Good results obtained in both two-and three-element prisms using variety of different glass materials.

B84-10301
THERMAL COMPENSATOR FOR PARABOLOIDAL REFLECTOR
C. G. STANICH (Daedalus Enterprises, Inc.) and F. G. OSTERWISCH (Daedalus Enterprises, Inc.)
Apr. 1985
NPO-16145 **Vol. 8, No. 4, P. 490**
Mounting structure holds off-axis paraboloidal collimating mirror so that optical axis constantly focused and remains stationary with respect to fixed point over wide temperature range.

B84-10302
PARABOLOIDAL-DISH POWER MODULES
W. R. REVERE (CALTECH), J. M. BOWYER (CALTECH), T. FUJITA (CALTECH), and H. I. AWAYA (CALTECH)
Apr. 1985
NPO-16100 **Vol. 8, No. 4, P. 490**
Study determines configurational tradeoffs for particular paraboloidal-dish power system for isolated-load applications. Continuous level of power supplied with high reliability by using power system with modular paraboloidal-dish power units.

04 MATERIALS

B84-10074
UPGRADING METALLURGICAL-GRADE SILICON
L. M. WOERNER (J.C. Schumacher Co.) and E. B. MOORE (J.C. Schumacher Co.)
Jan. 1985
NPO-15076 **Vol. 8, No. 3, P. 353**
Closed-loop process produces semiconductor-grade silicon. Metallurgical-grade silicon converted to ultrapure silicon by reacting with hydrogen and silicon tetrahalide to form trihalosilane, purifying this intermediate and again decomposing to high purity silicon in third stage. Heterogeneously and homogeneously nucleated polycrystalline silicon used in semiconductor device applications and in silicon photovoltaic solar cell fabrication.

B84-10075
CONTAINERLESS MANUFACTURE OF GLASS OPTICAL FIBERS
R. J. NAUMANN and E. C. ETHRIDGE
Jan. 1985
MFS-25905 **Vol. 8, No. 3, P. 354**
Contamination and crystallization reduced in proposed process. Solid optical fiber drawn from an acoustically levitated lump of molten glass. New material added in solid form, melted and then moved into main body of molten glass. Single axis acoustic levitation furnances levitate glass melts at temperature up to about 700 degrees C. Processing in unit limited to low-melting temperature glasses.

B84-10076
EQUATION FOR ELECTROLYTE VISCOSITY
R. F. FEDORS (CALTECH)
Jan. 1985
NPO-15096 **Vol. 8, No. 3, P. 355**
Equation agrees with measurements over wide concentration range. Plot of calculated values from equation and measured values show close match except at extremely low concentrations of electrolyte. Other equations do not match data as well and limited to dilute solutions.

B84-10077
PRESSURE-LETDOWN PLATES FOR COAL GASIFIERS
E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15965 **Vol. 8, No. 3, P. 355**

Variation of pseudoporous plates used with coal gasifiers in pressure letdown stage of processing minimize clogging. Rotating plates containing variable gap annuli continually change flow path to enable erosionless reduction of gas pressure. Particles that otherwise clog porous plugs pass through gaps.

B84-10078
TESTING CERAMICS FOR DIESEL ENGINES
H. W. SCHNEIDER (CALTECH)
Jan. 1985
NPO-15824 **Vol. 8, No. 3, P. 356**
Adaptation of diesel engine allows prestressed ceramic materials evaluated under realistic pressure, temperature, and stress without introducing extraneous stress. Ceramic specimen part of prechamber of research engine. Specimen held in place by clamp, introduces required axial compressive stress. Specimen -- cylindrical shell -- surrounded by chamber vented or pressurized to introduce requisite radial stress in ceramic. Pressure chamber also serves as safety shield in case speimen disintegrates. Materials under consideration as cylinder liners for diesel engines.

B84-10079
PURE GLASSES FROM MULTICOMPONENT GELS
S. P. MUKHERJEE (Battelle Columbus Laboratories)
Jan. 1985
NPO-16160 **Vol. 8, No. 3, P. 357**
Report describes experiments with multicomponent gels for preparation of pure glass. Experiments aimed at developing zerogravitation process for fabrication of low-loss optical fibers.

B84-10080
VACUUM BAKING TO REMOVE VOLATILE MATERIALS
J. A. MUSCARI (Martin Marietta Corp.)
Jan. 1985
NPO-15648 **Vol. 8, No. 3, P. 357**
Outgassing reduced in some but not all nonmetallic materials. Eleven polymeric materials tested by determining outgassing species as temperature of conditioned and unconditioned materials raised to 300 degrees C. Conditioning process consisted of vacuum bake for 24 hours at 80 degrees C in addition to usual cure. Baking did not change residual gas percentage of water molecules.

B84-10081
SOLUTION POTENTIALS INDICATE ALUMINUM-ALLOY TEMPERS
M. D. DANFORD
Jan. 1985 See Also NASA TM-82459 (N82-22345)
MFS-25846 **Vol. 8, No. 3, P. 357**
Report discusses use of solution potential as measure of temper of aluminum alloys. Technique based on fact that different tempers or heat treatments exhibit different solution potentials as function of aging time.

B84-10082
PROPERTIES OF LOW-EXPANSION LAMINATES
M. KURAL (Lockheed Missiles & Space Company, Inc.)
Jan. 1985
MFS-25859 **Vol. 8, No. 3, P. 358**
Laminate elastic constants and coefficients of thermal expansion calculated for near-zero-expansion graphite/ aluminum and graphite/ magnesium composites. Report presents results in graphic form for these properties as function of laminate angle and fiber volume fraction for four high-modulus continuous-pitch fiber.

B84-10083
ELASTOMER ENCAPSULANT FOR SOLAR-CELL ARRAYS
B. BAUM (Springborn Laboratories, Inc.) and P. B. WILLIS (Springborn Laboratories, Inc.)
Jan. 1985
NPO-15663 **Vol. 8, No. 3, P. 358**
Butyl acrylate syrups useful potting compounds for encapsulating photovoltaic cells in modular arrays. Material pourable liquid pumped into module, then cured to rubbery consistency. Cured material is thermoset elastomer highly transparent, low cost, flexible and with good low-temperature properties.

B84-10084
EUTECTIC-ALLOY MORPHOLOGY
R. G. PIRICH (Grumman Aerospace Corp.) and W. J. POIT (Grumman Aerospace Corp.)
Jan. 1985
MFS-25937 **Vol. 8, No. 3, P. 358**
Deviation in controlled-rod eutectic morphology anticipated for diffusion only crystal growth characterized at low solidification velocities. Naturally induced, gravity-related convective instabilities result in nonalined irregularly dispersed fibers or platelets. Lower solidification limit for controlled growth Bi/Mn alloys is 1 centimeter/ hour.

B84-10085
RELIABILITY STUDIES FOR FATIGUE-CRACK DETECTION
B. K. CHRISTNER (Martin Marietta Corp.), W. D. RUMMEL (Martin Marietta Corp.), and J. KNADLER (Martin Marietta Corp.)
Jan. 1985
MFS-27031 **Vol. 8, No. 3, P. 358**
Reusable test panels available to assess reliability of techniques that use fluorescent penetrant to detect fatigue cracks. Ultrasonic cleaning method developed for removing penetrant from panels prior to reuse.

B84-10086
MAKING PURE FINE-GRAINED INORGANIC POWDER
C. WOOD (CALTECH)
Jan. 1985
NPO-16398 **Vol. 8, No. 3, P. 358**
Sustained arc plasma chemical reactor fabricates very-fine-grained inorganic solids having low thermal conductivity. Powder fabrication method, based on plasma tube technique produces pure solids without contamination commonly produced by grinding.

B84-10087
FLUIDIZED-BED REACTOR SYSTEM
A. D. MORRISON (CALTECH)
Jan. 1985
NPO-15975 **Vol. 8, No. 3, P. 359**
Gas pyrolysis in hot fluidized beds minimized by use of selectively filtered radiation and parabolic cavity. Reactor is parabolic cavity of two or more axes in which light emanating from one axis bounces off walls of cavity and passes through object axis to heat sample.

B84-10088
SAMARIUM/COBALT MAGNETS
D. DAS (Charles Stark Draper Laboratories, Inc.), K. KUMAR (Charles Stark Draper Laboratories, Inc.), R. FROST (Charles Stark Draper Laboratories, Inc.), and C. CHANG (Charles Stark Draper Laboratories, Inc.)
Jan. 1985
MFS-27006 **Vol. 8, No. 3, P. 359**
Intrinsic magnetic coercivities of samarium cobalt magnets made to approach theoretical limit of 350 kA/m by carefully eliminating oxygen from finished magnet by hot isostatic pressing (HIP). HIP process viable alternative to currently used sintering process.

B84-10089
REDUCING LIQUID PERMEATION THROUGH POLYMER SHEETS
R. F. FEDORS (CALTECH)
Jan. 1985
NPO-15802 **Vol. 8, No. 3, P. 359**

Permeation of liquid through polymer sheets retarded by including in polymer solute for excluded liquid. Long-term or steady state permeability not reduced by solute inclusions.

B84-10090
COAL-FACE FRACTURE WITH A TWO-PHASE LIQUID
E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15849 **Vol. 8, No. 3, P. 359**

In new method for mining coal without explosive, two-phase liquid such as CO2 and water, injected at high pressure into deeper ends of holes drilled in coal face. Liquid permeates coal seam through existing microfractures; as liquid seeps back toward face, pressure eventually drops below critical value at which dissolved gas flashvaporizes, breaking up coal.

B84-10091
POLYURETHANE-FOAM MASKANT
R. BODEMEIJER (Rockwell International Corp.)
Jan. 1985
MFS-19786 **Vol. 8, No. 3, P. 359**

Brown wax previously used to mask hardware replaced with polyurethane foam in electroplating and electroforming operations. Foam easier to apply and remove than wax and does not contaminate electrolytes.

B84-10092
STREAMING-POTENTIAL STUDIES
D. GREGONIS (University of Utah), R. VAN WAGENEN (University of Utah), S. MA (University of Utah), and J. ANDRADE (University of Utah)
Jan. 1985
MFS-25657 **Vol. 8, No. 3, P. 359**

Apparatus and experimental technique based on measurements of streaming potentials evaluates effects of surface coatings for reducing or eliminating electro-osmotic flow.

B84-10093
MATHEMATICAL MODEL FOR GAS DISSOLUTION IN GLASS
M. C. WEINBERG (GTE), P. I. ORONATO (GTE), and D. R. UHLMANN (MIT)
Jan. 1985
NPO-15104 **Vol. 8, No. 3, P. 360**

Mathematical model calculates rate of small oxygen-bubble contraction in soda/lime/silicate melts in presence of foreign nondiffusing gas. Process of interest in optical glass fabrication.

B84-10303
DESULFURIZATION OF COAL IN FLUIDIZED BEDS
R. MADDURY (CALTECH) and J. KALVINSKAS (CALTECH)
Apr. 1985
NPO-15924 **Vol. 8, No. 4, P. 493**

Experimental dry chemical process for removing sulfur from coal-and thereby reducing harmful sulfur emissions from coal-fired electric powerplants-promises more economical and effective than older wet chemical processes. New process faster, requires smaller amounts of chemical reagents, and produces no liquid effluents, which poses disposal problem.

B84-10304
INCREASING THE DUCTILITY OF ELECTROPLATED METALS
N. PATON (Rockwell International Corp.) and C. RHODES (Rockwell International Corp.)
Apr. 1985
MFS-19873 **Vol. 8, No. 4, P. 494**

Hot isostatic pressing effective in improving ductility of metal plating. Previously hot isostatic pressing used on powder-metallurgy parts and castings but not on electroplated parts. To test idea, copperplated heated to 800 degrees C at pressure of 23,000 psi (160 MN/m2) for 4 hours. When part examined metallographically, completely free from porosity.

B84-10305
EUTECTIC CONTACT INKS FOR SOLAR CELLS
B. ROSS (Bernd Ross Associates)
Apr. 1985
NPO-15171 **Vol. 8, No. 4, P. 494**

Low-resistance electrical contacts formed on solar cells by melting powders of eutectic composition of semiconductor and dopant. Process improves cell performance without subjecting cell to processing temperatures high enough to degrade other characteristics.

B84-10306
LIGHTWEIGHT HIGH-TEMPERATURE THERMAL INSULATION
W. R. WAGNER (Rockwell International Corp.) and J. I. FASHEH (Rockwell International Corp.)
Apr. 1985
MFS-19754 **Vol. 8, No. 4, P. 495**

Fine Ni/Cr fibers sintered into corrosion-resistant, fireproof batt. Possible applications include stoves, furnaces, safes, fire clothing, draperies in public buildings, wall firebreaks, airplane walls, and jet engine components. New insulation takes advantage of some of same properties of nickel/chromium alloy useful in heating elements in toasters, namely, corrosion and oxidation resistance even at high temperatures.

B84-10307
INHIBITING WET OXIDATION OF AMMONIA
D. B. L. ONISKO (National Research Council)
Apr. 1985
ARC-11407 **Vol. 8, No. 4, P. 496**

Simple modification of wet-oxidation process for treating organic waste reduces loss of fixed nitrogen, potentially valuable byproduct of process. Addition of sufficient sulfuric acid to maintain reaction pH below 3 greatly reduces oxidation of ammonia to free nitrogen. No equipment modification required.

B84-10308
APPLYING UNIFORM POLYMER COATINGS TO MICROSPHERES
M. C. LEE (CALTECH)
Apr. 1985
NPO-16075 **Vol. 8, No. 4, P. 496**

Acoustic levitation yields even coating on glass microspheres. Automatic Coating Apparatus injects polymer into acoustic levitator, moves glass sphere into polymer, dries polymer, and removes coated sphere. Apparatus injects more polymer for coating another sphere, and cycle repeats.

B84-10309
DEFECT CHEMISTRY OF HG1-XCDXTE
H. VYDYANATH (Honeywell, Inc.), D. NELSON (Honeywell, Inc.), J. DONOVAN (Honeywell, Inc.), P. CRICKARD (Honeywell, Inc.), A. BARNES (Honeywell, Inc.), R. ABBOTT (Honeywell, Inc.), and R. LANCASTER (Honeywell, Inc.)
Apr. 1985
MFS-25851 **Vol. 8, No. 4, P. 497**

Intermediate goal of this investigation to correlate nature and concentration of lattice defects with physicochemical conditions of preparation; namely, temperature, partial pressures of constituent elements and/or dopant concentration. Result of this investigation: possible to predict and control nature and concentration of defects as function of preparation conditions.

B84-10310
LOW-TEMPERATURE EXTRACTION OF OIL FROM SHALE
L. E. COMPTON (CALTECH)
Apr. 1985
NPO-15656 **Vol. 8, No. 4, P. 498**

Technique increases recovery and energy efficiency. Advantages of method greater product yield and, because of the relatively low temperatures, minimal gas formation, smaller amounts of char byproduct, and less carbonate-rock decomposition. Up to 94 percent by weight of organic material in shale extracted.

B84-10311
HIGH-TEMPERATURE COATING FOR TITANIUM
R. J. MELL (IIT Research Institute) and Y. HARADA (IIT Research Institute)
Apr. 1985
NPO-16222 **Vol. 8, No. 4, P. 498**
Wet coating mixture composed of graphite pigment potassium silicate binder solution and distilled water. Resulting coating has electrical resistivity of less than 10 to the 6th power ohm-cm.

B84-10312
PREDICTING POLYMER/LIQUIDE INTERACTIONS
R. F. FEDORS (CALTECH)
Apr. 1985
NPO-14874 **Vol. 8, No. 4, P. 498**
Calculations of liquid absorption by rubber vulcanizates agree with experimental results. Equation allows calculation of swelling of rubber vulcanizates by liquids, based on knowledge of chemical structure of polymer and solvent. Calculated values agree favorably with experimental data.

B84-10313
SILICON FORMATION FOR SOLAR CELLS
K. SANCIER (SRI International)
Apr. 1985
NPO-14973 **Vol. 8, No. 4, P. 498**
Highly pure silicon obtained for solar cells by proposed technique that sprays liquid-sodium droplets into SiF4 gas. Resulting freely flowing powder of silicon and sodium fluoride will not adhere to reactor walls and easily transferred to melt separator to recover silicon.

B84-10314
INTEGRATED FUEL CELL/COAL GASIFIER
J. F. FERRALL (CALTECH)
Apr. 1985
NPO-16062 **Vol. 8, No. 4, P. 498**
Powerplant design with low-temperature coal gasifier coupled to highly-exothermic fuel cell for efficient production of dc power eliminates need for oxygen in gasifier and achieves high fuel efficiency with recycling of waste heat from fuel cell.

B84-10315
ELASTOMERIC CATHODE BINDER
S. P. S. YEN (CALTECH), D. S. SHEN (CALTECH), and R. B. SOMOANO (CALTECH)
Apr. 1985
NPO-15424 **Vol. 8, No. 4, P. 499**
Soluble copolymer binder mixed with cathode material and solvent forms flexible porous cathode used in lithium and Ni/Cd batteries. Cathodes prepared by this process have lower density due to expanding rubbery binder and greater flexibility than conventional cathodes. Fabrication procedure readily adaptable to scaled-up processes.

B84-10316
ACTIVATED INTERNAL GETTERING
J. K. LIU (CALTECH), G. H. SCHWUTTKE, and K. M. KOLIWAD
Apr. 1985
NPO-15530 **Vol. 8, No. 4, P. 499**
Lifetimes of minority carriers in silicon webs improved by annealing. Heat treatment of silicon web ribbons considerably improves efficiency of solar cells.

B84-10317
PREPARING INSB SUBSTRATES
R. P. VASQUEZ (CALTECH), B. F. LEWIS (CALTECH), and F. J. GRUNTHANER (CALTECH)
Apr. 1985
NPO-16127 **Vol. 8, No. 4, P. 499**
Molecular-beam epitaxial substrates passivated by chloride film growth. Chloride layer produced by direct chlorination, by chloride radicals in solutions, or by formation of preliminary oxide layer followed by chloride substitution.

B84-10318
CLEANING THE WALLS OF A SILANE REACTOR
K. A. YAMAKAWA (CALTECH)
Apr. 1985
NPO-15851 **Vol. 8, No. 4, P. 499**
Scraper removes silicon deposits from inner walls of reactor vessel. Scraper supported by gas bearing. Scraper made of non-contaminating material such as quartz or silicon.

B84-10319
STABILIZED ALUMINUM TITANATE
J. E. SCHROEDER (CALTECH)
Apr. 1985
NPO-16227 **Vol. 8, No. 4, P. 499**
Stable, potentially-inexpensive, cubic crystalline alpha aluminum titanate that shows no phase change to 1,700 K used in heat exchangers. Particular stabilizing species must be selected with careful attention to crystal dimensions and bond angles of alpha and beta phases of aluminum titanate.

B84-10320
MOLTEN-SALT ELECTROLYSIS
D. CUBICCIOTTI (SRI International)
Apr. 1985
NPO-15535 **Vol. 8, No. 4, P. 499**
Concept of electrolytic decomposition of gaseous hydrogen sulfide to yield gaseous sulfur at anode and hydrogen gas at cathode considered.

05 LIFE SCIENCES

B84-10094
TRANSDUCERS FOR HEAT RESEARCH
C. FELDSTEIN (CALTECH), S. MEERBAUM (CALTECH), G. W. LEWIS (CALTECH), and V. H. CULLER (CALTECH)
Jan. 1985
NPO-15095 **Vol. 8, No. 3, P. 363**
Series of transducers with seven different configurations enable measurement of forces and displacements in heart wall. New transducers small, cause minimal perturbation of heart function and attached and detached without causing excessive tissue damage. All units implanted or removed during single heartbeat, permitting rapid relocation for detail mapping.

B84-10095
AQUATIC PLANTS AID SEWAGE FILTER
B. C. WOLVERTON
Jan. 1985
MFS-25808 **Vol. 8, No. 3, P. 364**
Method of wastewater treatment combines micro-organisms and aquatic plant roots in filter bed. Treatment occurs as liquid flows up through system. Micro-organisms, attached themselves to rocky base material of filter, act in several steps to decompose organic matter in wastewater. Vascular aquatic plants (typically, reeds, rushes, cattails, or water hyacinths) absorb nitrogen, phosphorus, other nu-

trients, and heavy metals from water through finely divided roots

B84-10096
MONITORING MARINE MICROBIAL FOULING
R. COLWELL (University of Maryland)
Jan. 1985
MFS-25928 **Vol. 8, No. 3, P. 364**
Two techniques developed for studying marine fouling. Methods originally developed to study fouling of materials used in Space Shuttle solid fuel booster rockets. Methods used to determine both relative fouling rates and efficacy of cleaning methods to remove fouling on various surfaces including paints, metals, and sealants intended for marine use.

B84-10097
EXPERIMENTAL ECOSYSTEMS SEALED IN GLASS
J. A. HANSON (CALTECH)
Jan. 1985
NPO-15712 **Vol. 8, No. 3, P. 365**
Report describes investigation of dynamics of microbial ecosystems sealed in 1-liter flasks and exposed to Sunlight or artifical light for extended periods. Many organisms survived more than 15 years. Such svstems have primary productivity and quantum efficiencies comparable to estimates for Earth's ecosystems.

B84-10098
ESTIMATING HEALTH SERVICES REQUIREMENTS
H. M. ALEXANDER (CALTECH)
Jan. 1985
NPO-14151 **Vol. 8, No. 3, P. 366**
In computer program NOROCA populations statistics from National Center for Health Statistics used with computational procedure to estimate health service utilization rates, physician demands (by specialty) and hospital bed demands (by type of service). Computational procedure applicable to health service area of any size and even used to estimate statewide demands for health services.

B84-10099
PARAMETERS AFFECTING ELECTROPHORESIS
J. VANDERHOFF (Lehigh University) and F. MICALE (Lehigh University)
Jan. 1985
MFS-25593 **Vol. 8, No. 3, P. 366**
Experimental approaches and problems facing successful continuous particle separation by electrophoresis outlined in short report. Influence of particle size, concentration, and charge discussed.

B84-10100
DIALYSIS EXTRACTION FOR CHROMATOGRAPHY
V. J. JAHNSEN (CALTECH)
Jan. 1985
NPO-15691 **Vol. 8, No. 3, P. 366**
Chromatographic-sample pretreatment by dialysis detects traces of organic contaminants in water samples analyzed in field with minimal analysis equipment and minimal quantities of solvent. Technique also of value wherever aqueous sample and solvent must not make direct contact.

B84-10321
PROBE FOLLOWER FOR MOVING BLOOD VESSELS
R. E. FRAZER (CALTECH) and T. W. ANDREWS (CALTECH)
Apr. 1985
NPO-15898 **Vol. 8, No. 4, P. 503**
Probes track vessel expansion and contraction with minimal perturbation. Nozzle back-pressure changes at cuff on blood vessel basis for monitoring position of probe in blood vessel. Fluidic amplifiers use signals to control three-axis servo that centers measuring probe between sensing-nozzle pairs at cuff.

B84-10322
PHOTOGRAPHIC SCREENING FOR EYE DEFECTS
J. RICHARDSON
Apr. 1985 See Also NASA TM-82359 (N83-34565/NSP)
MFS-27045 **Vol. 8, No. 4, P. 504**
Images of retinas examined for characteristic patterns. Color photographs of retinas taken. Proper alinement of eye obtained by asking subject to gaze at light-emitting diode. 'Red-eye' patterns in resulting color photographs examined by trained observers for signs of ocular defects. System used to check power of contact lenses and eyeglasses by taking photographs with these items in place.

06 MECHANICS

B84-10101
TEMPERATURE-GRADIENT FURNACE FOR SOLIDIFICATION EXPERIMENTS
B. R. ALDRICH and W. D. WHITT
Jan. 1985
MFS-25963 **Vol. 8, No. 3, P. 369**
Gradients are controllable from zero to 500 degrees C/cm. Typical temperature profile superimposed on partial cross section of furnace. Steepness of gradient varied by adjusting flow of energy to and from different zones of furnace. Specimen placed in ampoule moved inside ceramic tube according to needs of experiment. Furnace provides axial temperature profiles for material processing experiments.

B84-10102
IMPROVED ELLIPSOIDAL RADIATION FURNACE
E. C. ETHRIDGE
Jan. 1985
MFS-25933 **Vol. 8, No. 3, P. 370**
Spherical reflector around heat source increases efficiency and minimizes power requirements. Furnace consists of ellipsoid with point heat source, at one focus and sample heated at other focus. Spherical reflector with circular slit surrounds heat source. All radiation not passing through circular slit in spherical reflector reflected back to lamp. Radiation passing through spherical slit focused by ellipsoid surface onto sample. Arrangement uses heat efficiently, reduces waste heat generation and permits full view of specimen.

B84-10103
DOUBLE LINEAR DAMAGE RULE FOR FATIGUE ANALYSIS
G. HALFORD and S. MANSON (Case Western Reserve University)
Feb. 1985 See Also NASA TM-81517 (N80-23684/NSP)
LEW-14058 **Vol. 8, No. 3, P. 371**
Double Linear Damage Rule (DLDR) method for use by structural designers to determine fatigue-crack-initiation life when structure subjected to unsteady, variable-amplitude cyclic loadings. Method calculates in advance of service how many loading cycles imposed on structural component before macroscopic crack initiates. Approach eventually used in design of high performance systems and incorporated into design handbooks and codes.

B84-10104
EDDY-CURRENT INSPECTION OF BALL BEARINGS
B. BANKSTON
Jan. 1985
MFS-25833 **Vol. 8, No. 3, P. 371**
Custom eddy-current probe locates surface anomalies.

Low friction air cushion within cone allows ball to roll easily. Eddy current probe reliably detects surface and near-surface cracks, voids, and material anomalies in bearing balls or other spherical objects. Defects in ball surface detected by probe displayed on CRT and recorded on strip-chart recorder.

B84-10105
SURFACE-STREAMLINE FLOW VISUALIZATION
L. LANGSTON (University of Connecticut) and M. BOYLE (University of Connecticut)
Jan. 1985
LEW-13875 **Vol. 8, No. 3, P. 372**

Matrix of ink dots covers matte surface of polyester drafting film. Film placed against wind-tunnel wall. Layer of methyl salicylate (oil of wintergreen) sprayed over dotted area. Ink dot streaklines show several characteristics of flow, including primary saddle point of separations, primary horseshoe vortex and smaller vortex at cylinder/ endwall junction. Surface streamline flow visualization technique suitable for use in low-speed windtunnels or other low-speed gas flows.

B84-10106
STRUCTURAL TURNBUCKLE BEARS COMPRESSIVE OR TENSILE LOADS
W. A. BATEMAN (Rockwell International Corp.) and C. H. LANG (Rockwell International Corp.)
Jan. 1985
MFS-25939 **Vol. 8, No. 3, P. 373**

Column length adjuster based on turnbuckle principle. Device consists of internally and externally threaded bushing, threaded housing and threaded rod. Housing attached to one part and threaded rod attached to other part of structure. Turning double threaded bushing contracts or extends rod in relation to housing. Once adjusted, bushing secured with jamnuts. Device used for axially loaded members requiring length adjustment during installation.

B84-10107
BEAM WINDOW FOR PRESSURE CHAMBERS
J. W. BRANSFORD (National Bureau of Standards) and J. G. AUSTIN JR. (National Bureau of Standards)
Jan. 1985
MFS-25961 **Vol. 8, No. 3, P. 374**

Window resists products of combustion experiments. Sodium chloride window seals over chamber pressures from 0.1 to 13.8 MPa while absorbing minimal energy from CO2 laser beam that passes through it into chamber. Window inexpensive and easily replacable.

B84-10108
FABRICATING THIN-SHELL HEAT-TRANSFER MODELS
D. E. AVERY, G. K. BALLARD, M. L. WILSON, and J. H. ALLEN SR. (Johnson Space Center)
Jan. 1985
LAR-13087 **Vol. 8, No. 3, P. 375**

Freestanding shells produced for experimental aerodynamic-heating tests. Heat transfer shells require several steps and several precise molds. First, interlocking aluminum male and female molds fabricated. Holes for thermocouples drilled through male mold at desired locations. Wires having same diameter as thermocouple wire placed through holes in male mold flush to female mold. Epoxy exposed to vacuum to remove air bubbles poured between male and female molds to form thin female mold. Once mold cured, wires removed and aluminum molds separated.

B84-10109
FLEXIBLE HEAT PIPE
W. B. BIENERT (Dynatherm Corp.) and D. A. WOLF (Dynatherm Corp.)
Jan. 1985
GSC-12864 **Vol. 8, No. 3, P. 376**

Narrow Tube carries 10 watts or more to moving parts. Heat pipe 12 inches long and diameter of 0.312 inch (7.92mm). Bent to minimum radius of 2.5 blocks. Flexible section made of 321 stainless steel tubing (Cajon Flexible Tubing or equivalent). Evaporator and condenser made of oxygen free copper. Working fluid methanol.

B84-10110
UNIFORM-TEMPERATURE WALLS FOR CLOUD CHAMBERS
G. FLEISCHMAN (Hughes Aircraft Co.)
Jan. 1985
MFS-25931 **Vol. 8, No. 3, P. 376**

Flat heat pipes rapidly transfer heat to and from experimental volumes. Heat pipe vapor chamber carries heat to and from thermo electric modules. Critical surface acts as evaporator or condenser in cloud physics experiments. Used as walls of spaceborne atmospheric cloud chambers. On Earth, used as isothermal floors for environmental test chambers.

B84-10111
ENERGY-ABSORBING AIRFRAMES FOR GENERAL AVIATION
H. D. CARDEN, R. J. HAYDUK, J. CRONKHITE (Helicopter Textron, Inc.), and V. BERRY (Helicopter Textron, Inc.)
Jan. 1985 See Also NASA CR-3603 (N82-33735/NSP)
LAR-12808 **Vol. 8, No. 3, P. 377**

Concept for protecting people in lightweight airplane crashes involves redesigning area between interior floor and outer skin of airplane belly to create subfloor strong enough to bear stresses of flight but crush under force of impact. Several concepts evaluated and five selected and designed as lower fuselage sections tested in NASA's crash-testing program. Notched corner concept, Corrugated Beam concept, Foam-Filled Cylinder concept, Corrugated Half Shell concept, and Canted Bulkhead concept. Experimental and analytical results indicate all five concepts perform well; upper floor remains structurally intact whereas crush zone collapses under essentially constant load.

B84-10112
INTERFEROMETER DETECTS ACOUSTIC EMISSIONS IN COMPOSITES
J. H. CANTRELL JR., R. O. CLAUSE (Virginia Polytechnic Institute and State University), J. C. WADE (Virginia Polytechnic Institute and State University), and P. S. ZERWEKH (Virginia Polytechnic Institute and State University)
Jan. 1985
LAR-12965 **Vol. 8, No. 3, P. 378**

Embedded single-mode optical fibers sample internal-stress fields directly. Statically loaded composite matrix emits pulsed ultrasonic waves which mechanically modulate embedded fiber and phase-modulate transmitted optical field. Modulation detected by optical interferometry and Fourier optical processing converted to electronic signal proportional to acoustic field amplitude integated along length of fiber embedded in specimen. Technique used for measurements of both high- and low-frequency CW acoustic fields as well as high-frequency transients.

B84-10113
MEASURING ABSOLUTE OXYGEN PRESSURE
R. RICHTER (CALTECH)
Jan. 1985
NPO-16131 **Vol. 8, No. 3, P. 379**

Sensor determines absolute pressure of oxygen without reference pressure source. Absolute oxygen pressure transducer with control circuit enables measurement without reference pressure. Transducer, two part device, combines solid electrolyte membranes sensor with diffusional orifice. Device adapted for direct control of oxygen pressure in combustion mixtures.

B84-10114
LOW-STRESS SEALING OF PRESSURE TRANSDUCERS
R. E. KROY (Rockwell International Corp.)
Jan. 1985

MFS-19877 **Vol. 8, No. 3, P. 380**

Compliant washer seals high pressures without excessive compressive stress on transducer. Conformal washer serves as effective seal for transducer passing through walls of pressure vessel. Washer makes it unnecessary to tighten mounting nut to high torque, which could damage transducer or adversely affect accuracy. Washer also used to seal mountings for temperature sensors and other devices.

B84-10115
PREVENTING FIRES IN CRYOGENIC OXIDIZER LINES
W. R. WAGNER (Rockwell International Corp.)
Jan. 1985
MFS-19830 **Vol. 8, No. 3, P. 380**

Friction and compression induced ignition prevented by heat-dissipation layer. Thin layer of copper placed inside surfaces of pipes and other parts in contact with flowing liquid oxygen, fluorine, or other oxidizers. Copper layer of only 0.001 to 0.005 inch (0.0254 to 0.127 mm) ensures heat away from hotspots thereby discouraging ignition. Copper layer increases oxygen ignition threshold of pipe by 5 to 20 times.

B84-10116
MEASURING RIND THICKNESS ON POLYURETHANE FOAM
C. JOHNSON (Martin Marietta Corp.), J. MILLER (Martin Marietta Corp.), and H. BROWN (Martin Marietta Corp.)
Jan. 1985
MFS-25941 **Vol. 8, No. 3, P. 381**

Nondestructive test determines rind thickness of polyurethane foam. Surface harness of foam measured by Shore durometer method: hardness on Shore D scale correlates well with rind thickness. Shore D hardness of 20, for example, indicates rind thickness of 0.04 inch (1 millimeter). New hardness test makes it easy to determine rind thickness of sample nondestructively and to adjust fabrication variables accordingly.

B84-10117
REDUCING THERMAL EXPANSIVITY OF COMPOSITE PANELS
D. D. SMITH (Boeing Aerospace Co.)
Jan. 1985
MFS-25793 **Vol. 8, No. 3, P. 382**

Coefficient of thermal expansion of laminated graphite/epoxy composite panels altered after panels cured by postcuring heat treatment. Postcure decreases coefficient of thermal expansion by increasing crosslinking between molecules. Treatment makes it possible to reprocess costly panels for requisite thermal expansivity instead of discarding them.

B84-10118
SINTERED LINING FOR HEAT-PIPE EVAPORATOR
D. M. ERNST (Thermacore, Inc.) and G. Y. EASTMAN (Thermacore, Inc.)
Jan. 1985
NPO-16172 **Vol. 8, No. 3, P. 382**

Hotspots eliminated by lining inner wall. Distribution of heat transfer liquid in heat-pipe evaporator improved by lining inner wall with layer of sintered metal. Sintered layer takes place of layer of screen wick formerly sintered or bonded to wall. Since sintered layer always full of liquid, no hotspot of type that previously arose where former screen wick did not fit properly against wall.

B84-10119
JOINT FOR ERECTABLE AND COLLAPSIBLE FRAMES
T. E. PELISCHEK
Jan. 1985
MSC-20635 **Vol. 8, No. 3, P. 383**

Joint mechanism allows truss structure to be folded and stowed in small space. Mechanism includes hinge attached to two truss elements connected by two links, tension bar, and compression bar. When folded elements are released, springs in joint mechanism rotate truss elements about hinge and lock mechanism to form single member. Developed for structures erected in space (antennas, solar panels, solar sails, and masts), joint mechanism adaptable to window-opening struts, folding furniture and television antennas.

B84-10120
LIGHTNING PROTECTION FOR COMPOSITE AIRCRAFT STRUCTURES
G. O. OLSON (The Boeing Co.)
Jan. 1985
LAR-12879 **Vol. 8, No. 3, P. 384**

Lightning protection system consisting of two layers of aluminum foil separated by layer of dielectric material protects graphite/epoxy composite structures on aircraft. Protective layer is secondarily applied lightning protection system, prime advantage of which is nullification of thermal and right angle effect of lightning arc attachment to graphite/epoxy laminate.

B84-10121
EFFICIENT JOINTS FOR GRAPHITE/EPOXY STRUCTURES
D. E. SKOUMAL (Boeing Aerospace Co.) and J. B. CUSHMAN (Boeing Aerospace Co.)
Jan. 1985 See Also NASA CR-3602 (N83-16787 NSP)
LAR-13091 **Vol. 8, No. 3, P. 385**

Bonded joints perform well through wide temperature range. Tests indicate significant improvement in joint efficients available through geometric modifications and hybrid material additions at adherent interfaces. Material modifications consisted of placing S-glass polyimide fabric in joint between adherents. Most fabric interface specimens delaminated between two fabric plies as opposed to failing in base adherents.

B84-10122
ACQUISITION OF DYNAMIC STRESS/STRAIN DATA
R. G. MINES (Rockwell International Corp.) and R. J. DEMONET (Rockwell International Corp.)
Jan. 1985
MSC-20589 **Vol. 8, No. 3, P. 385**

Computer program enables real-time data acquisition and plotting of stress strain by small, desk top computer. Program monitors load cell and multiple-strain gages during tension or compression loading. Scan routine triggered by specified change of applied load or longitudinal strain.

B84-10123
DYNAMIC SIMULATION AND STABILITY ANALYSIS
H. P. FRISCH and J. A. SANBORN
Jan. 1985
GSC-12810 **Vol. 8, No. 3, P. 385**

Dynamic Interaction Simulation of Controls and Structure (DISCOS) program developed for dynamic simulation and stability analysis of passive and actively controlled spacecraft. In use of DISCOS, physical system undergoing analysis generally described as cluster of contiguous flexible structures (bodies) that comprise mechanical system, such as spacecraft.

B84-10124
AERODYNAMIC ANALYSIS OF LOW-SPEED WING-FLAP SYSTEMS
H. W. CARLSON (Kentron International, Inc.) and K. B. WALKLEY (Kentron International, Inc.)
Jan. 1985
LAR-13116 **Vol. 8, No. 3, P. 386**

SUBAERF program developed for aerodynamic analysis and design of lowspeed wing-flap systems. SUBAERF based on linearized theory lifting-surface solution. Low speed aerodynamic analysis method used in SUBAERF provides estimates of wing performance which include effects of attainable leading edge thrust and vortex lift.

B84-10125
TURBINE-ENGINE TRANSIENT-ROTOR ANALYSIS
V. GALLARDO JR. (General Electric Co.), M. STALLONE (General Electric Co.), A. STORACE (General Electric Co.), and G. BLACK (General Electric Co.)
Jan. 1985
LEW-13726 **Vol. 8, No. 3, P. 386**
Computer program developed to predict structural dynamics of rotor system in gas turbine engines subjected to sudden unbalance. TETRA computer code calculates transient structural response of turbine engines due to blade loss or other time-dependent events. Used on structures other than turbine engines with little or no modification.

B84-10126
HEAT-EXCHANGER COMPUTATIONAL PROCEDURE FOR TEMPERATURE-DEPENDENT FOULING
L. CHIAPPETTA (United Technologies Corp.) and E. SZETELA (United Technologies Corp.)
Jan. 1985
LEW-13874 **Vol. 8, No. 3, P. 387**
Computer program predicts heat-exchanger performance under variety of conditions. Program provides rapid means of calculating distribution of fluid and wall temperatures, fuel deposit formation, and pressure losses at various locations in heat exchanger. Developed for use with heat exchanger that vaporizes fuel prior to fuel ignition; other applications possible.

B84-10127
STRUCTURAL ANALYSIS OF CYLINDRICAL THRUST CHAMBERS
W. ARMSTRONG (Lockheed Missiles & Space Co., Inc.) and M. PEARSON (Lockheed Missiles & Space Co., Inc.)
Jan. 1985
LEW-13655 **Vol. 8, No. 3, P. 387**
System of three computer programs developed for use with BOPACE finite-element program for analyzing cumulative plastic deformation of structures subject to high thermomechanical load cycles.

B84-10128
TURBULENT RECIRCULATING FLOWS IN ISOTHERMAL COMBUSTOR GEOMETRIES
D. LILLEY (Oklahoma State University) and D. RHODE (Oklahoma State University)
Jan. 1985
LEW-13894 **Vol. 8, No. 3, P. 387**
Computer program developed that provides mathematical solution to design and construction of combustion chambers for jet engines. Improved results in areas of combustor flow fields accomplished by this computerprogram solution, cheaper and quicker than experiments involving real systems for models.

B84-10129
COMPUTATION OF THREE-DIMENSIONAL COMBUSTOR PERFORMANCE
S. SRIVATSA (Garrett Turbine Engine Co.)
Jan. 1985
LEW-13930 **Vol. 8, No. 3, P. 388**
Existing steady-state 3-D computer program for calculating gasturbine flow fields modified to include computation of soot and nitrogen oxide emission. In addition, radiation calculation corrected for soot particles. These advanced tools offer potential of reducing design and development time required for gas-turbine combustors.

B84-10130
GENERATING TABLES OF THERMODYNAMIC PROPERTIES
S. N. NGUYEN (Rockwell International Corp.)
Jan. 1985
MSC-20701 **Vol. 8, No. 3, P. 388**
Thermodynamic Property Generation program produces tables for any fluid for which state equation, vapor pressure equation, specific heat equation, and critical constants are known. Program calculates thermodynamic properties at any state providing way of obtaining properties at extreme environmental conditions.

B84-10131
TRAJECTORY ANALYSIS AND THE ORBIT DETERMINATION
D. J. ALDERSON (CALTECH), F. H. BRADY (CALTECH), P. J. BRECKHELMER (CALTECH), J. B. COLLIER (CALTECH), J. E. EKELUND (CALTECH), J. ELLIS (CALTECH), D. E. HILT (CALTECH), A. R. KHATIB (CALTECH), V. N. LEGERTON (CALTECH), S. K. MCMAHON (CALTECH) et al
Jan. 1985
NPO-15586 **Vol. 8, No. 3, P. 388**
Two programs aid in trajectory analysis. DPTRAJ, ODP and their supporting utility programs capable of handling massive amounts of data and performing numerical calculations required for solving navigation problems associated with planetary fly-by and lander missions. Used extensively in support of Voyager.

B84-10132
ORBITAL MECHANICS ANALYSIS PROGRAM
W. C. SIMON (Rockwell International Corp.), S. C. JANKOWSKI (Rockwell International Corp.), and T. B. HUGHES (Rockwell International Corp.)
Jan. 1985
MSC-20700 **Vol. 8, No. 3, P. 389**
Orbital Mechanics Analysis Program provides engineers with simple tool for analysis or synthesis of any orbital maneuvering function involving vehicle and target. Program useful in such applications as proximity operations and rendezvous maneuvers.

B84-10133
THERMAL RADIATION ANALYZER
R. A. VOGT, C. L. JENSEN (Martin Marietta Corp.), R. G. GOBLE (Martin Marietta Corp.), and R. J. CONNER (Martin Marietta Corp.)
Jan. 1985
MSC-20448 **Vol. 8, No. 3, P. 389**
Thermal Radiation Analyzer System TRASYS II solves radiation related aspects of thermal analysis problems. TRASYS II provides for calculation of internode radiation interchange data and for calculation of incident and absorbed heat rate data originating from environmental radiant heat sources. When TRASYS II used in conjunction with generalized thermal analysis program such as Systems Improved Numerical Differencing Analyzer (SINDA), any thermal problem expressed in terms of lumped parameter RC thermal network solved.

B84-10134
DATA-GENERATING PROGRAM FOR ASKA MODELING
A. KARIMI-DECHESH (Rockwell International Corp.) and T. K. CHENG (Rockwell International Corp.)
Jan. 1985
MSC-20644 **Vol. 8, No. 3, P. 390**
Carrier plate assemblies of NASA Space Shuttle thermal protection system provided for easy access to protected vital parts of Shuttle. Each assembly mounted on substructure with fasteners through holes in protective tiles. Automatic System of Kinematic Analysis (ASKA) finite-element program evaluates these assemblies. PLATEFORT computer program developed as data generator for ASKA modeling. PLATEFORT greatly reduces amount of time and data required for building ASKA model of these assemblies.

B84-10135
TRANSIENT RESPONSE ANALYSIS
L. D. BLACKMAN (Rockwell International Corp.)
Jan. 1985
MSC-20590 **Vol. 8, No. 3, P. 390**
Transient Response Analysis Program, TRAP aids in

analysis of frequency response of force-transmission and shock-damping devices. Devices analyzed with TRAP include hydraulic actuators, automotive shock absorbers and electromechanical actuators.

B84-10136
PREWHIRL JET MODEL
S. Y. MENG (Rockwell International Corp.), M. JENSEN (Rockwell International Corp.), and E. D. JACKSON
Jan. 1985
MFS-19826 **Vol. 8, No. 3, P. 390**
Simple accurate model of centrifugal or rocket engine pumps provides information necessary to design inducer backflow deflector, backflow eliminator and prewhirl jet in jet mixing zones. Jet design based on this model shows improvement in inducer suction performance and reduced cavitation damage.

B84-10137
MEASURING SIDE LOADS ON BOLTS
T. O. KILGROVE (CALTECH)
Jan. 1985
NPO-15705 **Vol. 8, No. 3, P. 390**
Side loads on clevis bolt measured quickly and easily. Such loads introduced during assembly of bolt and affect operation. Now, unwanted loads determined quantitatively and corrected.

B84-10138
EDDY-CURRENT REFERENCE STANDARD
H. H. AMBROSE JR. (Rocwkwell International Corp.)
Jan. 1985
MFS-19824 **Vol. 8, No. 3, P. 391**
Magnetic properties of metallic reference standards duplicated and stabilized for eddy-current coil measurements over long times. Concept uses precisely machined notched samples of known annealed materials as reference standards.

B84-10139
FLEXIBLE LIQUID-TRANSPORT TUBE
E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15761 **Vol. 8, No. 3, P. 391**
Flexible tube with zipper type arrangements of U-shaped side ribs and top plates allows liquids both transported and removed.

B84-10140
CONSERVING PURGE GASES
K. KAN (Rockwell International Corp.), L. BLEWETT (Rockwell International Corp.), and T. NELSON (Rockwell International Corp.)
Jan. 1985
MFS-19625 **Vol. 8, No. 3, P. 391**
Two-step flow control adjusts to dimensional changes in purged equipment. Two pressure actuated valves provide two-step control. When turbopump starts, helium flows through both valves. As pump operates its parts expand, clearance decrease and back pressure builds up on valves. At preset back pressure value, one valve closes, reducing helium flow.

B84-10141
SELECTING FLATPACK LEAD-FORMING DIES
E. L. CHOATE (Honeywell, Inc.)
Jan. 1985
MFS-25951 **Vol. 8, No. 3, P. 391**
Optical instrument accurately records unformed lead offset for each flatpack and provides better fit of flatpack to printed wiring board.

B84-10142
COILABLE-COLUMN DEVELOPMENT
P. R. PREISWERK (Astro Research Corp.), L. A. DINLEY (Astro Research Corp.), and K. KNAPP (Astro Research Corp.)
Jan. 1985
MFS-27032 **Vol. 8, No. 3, P. 391**
Design changes for longeron columns allow fabrication of larger structures.

B84-10143
MAINTAINING CONSTANT LOAD CELL TEMPERATURE
G. D. VAN MARK (Beech Aircraft Corp.)
Jan. 1985
MSC-20333 **Vol. 8, No. 3, P. 391**
Thermal insulation and temperature compensation device maintains constant temperature environment for load cells. At constant temperature, cells measure weight accurately and repoducibly.

B84-10144
DETECTION OF GAS SLUGS IN HEAT PIPES
J. A. JONES (CALTECH)
Jan. 1985
NPO-16064 **Vol. 8, No. 3, P. 391**
Temperature sensing system detects presence of gas slugs in heat pipes. System designed for operation between zero and 70 degrees C and detects noncondensable pockets of gas that result from decomposition of ammonia cooling fluid. Slugs 1 in. (25mm) in length detected.

B84-10145
A POSITIVE-SHUTOFF FUEL VALVE
J. TOLPEN (Rockwell International Corp.)
Jan. 1985
MFS-19779 **Vol. 8, No. 3, P. 392**
Pneumatically actuated ball valve utilizes continuous contact ball seat seals and dynamic delta seals in lieu of bellows to seal against low pressure leads in fuel supply lines.

B84-10323
X-RAY DETERMINATION OF WELD MISALINEMENT
C. W. NELSON (Beech Aircraft Corp.)
Apr. 1985
MSC-20418 **Vol. 8, No. 4, P. 507**
Simple technique uses ordinary X-ray equipment. Weld line between hemispheres of hidden spherical pressure vessel examined for misalinement between hemispheres. Central X-ray tangent to pressure vessel at weld line. Technique not limited to spheres. Also used to check alinement between insulated sections of pipelines or chemical-reaction vessels without removing insulation or interrupting flow or process.

B84-10324
INSULATION DEBOND DETECTION
G. D. JOHNSTON, A. D. COLEMAN, J. N. PORTWOOD, J. M. SAUNDERS, and A. J. PORTER
Apr. 1985
MFS-25862 **Vol. 8, No. 4, P. 508**
Load-cell and acoustic responses indicate bonding condition nondestructively. Signal recorded by load cell direct and instantaneous measure of local stiffness of material at point of impact. Separate and distinctly different measurement that sensed by microphone. Spectrum analysis of pulse obtained from debonded point will only show frequencies below 425 Hz because insulation alone does not have stiffness to support energy at higher frequencies.

B84-10325
DETERMINING THERMAL DIFFUSIVITIES OF RADIATING SPECIMENS
C. WOOD (CALTECH), R. A. LOCKWOOD (CALTECH), and K. SHIMADA (CALTECH)
Apr. 1985
NPO-15436; NPO-15441 **Vol. 8, No. 4, P. 509**
Two heat-pulse techniques eliminate uncertainties due to radiation losses. Flashlamp supplies pulse of heat to one side of specimen. Temperatures of illumninated surface

and of opposite surface monitored photometrically. In second method, pulse of electrons supplies heat to one side of specimen. Temperature of opposite side monitored by photon detector. Techniques needed because radiation heat losses in this temperature range introduce uncertainties into conventional heat-flux measurements.

B84-10326
HIGH-PRESSURE COUPLING FOR OPEN-ENDED TUBES
A. N. ANDERSON (Rockwell International Corp.)
Apr. 1985
MSC-20451 **Vol. 8, No. 4, P. 510**

Temporary fitting easily installed and removed without damage to tubes. Tube-end pressure coupling consists of few parts easy to install and remove. Couplings useful mainly for repeated temporary connections necessary for high pressure testing or prestressing of tubes with finished ends.

B84-10327
BRAZING ALLOYS INDICATE TURBOMACHINERY TEMPERATURES
J. W. SCHLAFF (Rockwell International Corp.)
Apr. 1985
MFS-19792 **Vol. 8, No. 4, P. 511**

Foils serve as consumable thermometers. Stainless-steel tab with circular window holds brazing-foil sample in place. Tab tacked to object to be tested with capacitive-discharge spot welder operating in range 10 + 1 joules. After measurements, tabs and samples chiseled off, leaving tested object fairly well intact. Technique used on objects made of alloys with iron, nickel, or cobalt as principal ingredients.

B84-10328
OVER-THE-WING PROPELLER REDUCES WING DRAG
J. L. JOHNSON JR. and R. WHITE (Kentron International, Inc.)
Apr. 1985
LAR-13134 **Vol. 8, No. 4, P. 512**

Airflow favorably altered if propeller placed above and behind wing. Relocating propeller induces flow over wing airfoil leading edge, which produces leading-edge suction forces not usually attainable by wing in free-stream flow. Concept reduced drag significantly on aircraft model in 12-foot (3.7-meter) wind tunnel. Relocation also helps to reduce cabin noise.

B84-10329
REUSABLE THERMAL BARRIER FOR INSULATION GAPS
C. E. SALADEE (Rockwell International Corp.)
Apr. 1985
MSC-20519 **Vol. 8, No. 4, P. 512**

Filler composed of resilient, heat-resistant materials. Thermal barrier nestles snugly in gap between two tiles with minimal protrusion beyond faces of surrounding tiles. When removed from gap, barrier springs back to nearly original shape. Developed for filling spaces between tiles on Space Shuttle, also used in furnaces and kilns.

B84-10330
DIFFERENTIAL PRESSURE HELPS SEAL BALL VALVE
J. K. MANGIALARDI (General Electric Co.)
Apr. 1985
MSC-20615 **Vol. 8, No. 4, P. 513**

Leakage suppressed despite O-ring wear. New design eliminates leakage in vacuum selector valve on Space Shuttle waste-control subsystem. Applied to improve sealing in laboratory and industrial vacuum systems and other plumbing involving switching among lines with pressure differentials of order of 1 atmosphere (0.1 MPa).

B84-10331
SPECIMEN HOLDER FOR ANALYTICAL ELECTRON MICROSCOPES
U. S. CLANTON, A. M. ISAACS (Lockheed), and I. MACKINNON (Microbeam)
Apr. 1985
MSC-20398 **Vol. 8, No. 4, P. 514**

Reduces spectral contamination by spurious X-ray. Specimen holder made of compressed carbon, securely retains standard electron microscope grid (disk) 3 mm in diameter and absorbs backscattered electrons that otherwise generate spurious X-rays. Since holder inexpensive, dedicated to single specimen when numerous samples examined.

B84-10332
IMPROVED COULOMB-FRICTION DAMPER
G. E. CAMPBELL (Rockwell International Corp.)
Apr. 1985
MSC-20505 **Vol. 8, No. 4, P. 515**

Equal damping provided on forward and reverse strokes. Improved damper has springs and wedge rings symmetrically placed on both ends of piston wedge, so friction force same in both directions of travel. Unlike conventional automotive shock absorbers, they resemble on outside, both versions require no viscous liquid and operate over wide temperature range.

B84-10333
FUEL-CONSERVATIVE DESCENTS USING A PROGRAMABLE CALCULATOR
C. E. KNOX
Apr. 1985 See Also TP-2085 (N83-17535/NSP)
LAR-13138 **Vol. 8, No. 4, P. 515**

Airborne descent algorithm used with or without time constraints. Concepts provide fuel savings by matching airplane arrival flow to airport acceptance rate through time control computations and allowing pilot to descend at his descretion from cruise altitude to designated metering fix in idle-thrust clean (landing gear up, flaps, zero, and speed brakes retracted) configuration. Also used for planning fuel-conservative descents when time is not consideration.

B84-10334
STING-MOUNTED FLOW SURVEY APPARATUS
G. C. ASHBY JR.
Apr. 1985
LAR-13157 **Vol. 8, No. 4, P. 516**

Flow survey instrumentation integral part of model support system. Drive motor, limit switches, and position transducer contained within streamlined housing and operable in near vacuum wing-tunnel environment. Sting-mounted system has advantages over conventional wall-mounted flow-field survey equipment, include more efficiently utilized run time, higher position accuracy, and fewer runs to map flow field.

B84-10335
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
R. W. HESS, W. T. DAVIS, and P. A. DAVIS
Apr. 1985 See Also NASA TM-85687 (N84-10538/NSP)
LAR-13094 **Vol. 8, No. 4, P. 517**

Sinusoidal calibration signal produced in 4- to 100-Hz range. Portable oscillating-pressure device measures dynamic characteristics of pressure transducers installed in models or aircraft at frequency and oscillating-pressure ranges encountered during unsteady-pressure-measurement tests. Calibration is over range of frequencies and amplitudes not available with commercial acoustic calibration devices.

B84-10336
ACOUSTO-OPTIC EXTENSOMETER FOR BOLTS
J. MARAM (Rockwell International Corp.) and G. KUHR (Rockwell International Corp.)
Apr. 1985
MFS-19914 **Vol. 8, No. 4, P. 518**

Bolt torque or tension deduced from non contacting measurements. Pulsed Laser induces shockwave in bolthead while continuous-wave acousto-optic detector monitors distortion produced by shock. Shock travel time measured

to determine bolt length. Solid-state position detector relatively inexpensive and keeps down cost of extensometer.

B84-10337
INTEGRATED EXHAUST-GAS-ANALYSIS SYSTEM
R. ANDERSON and R. SUMMERS
Apr. 1985 See Also NASA TM-81592 (N81-23435/NSP)
LEW-14062 **Vol. 8, No. 4, P. 519**

Gas-Analysis system includes eight commercial gas analyzers and data-processing and calibration electronics. Two microprocessors range analyzers, calibrate system, process raw data to units of concentration, and make all system information available to facility research computer and to operator. After initial setup, system operates several hours without significant operator attention. Saves considerable operator time.

B84-10338
MULTIPURPOSE PHOTONIC TRANSDUCERS
E. R. DU FRESNE (CALTECH) and W. L. DOWLER (CALTECH)
Apr. 1985
NPO-15135 **Vol. 8, No. 4, P. 520**

Features include smallness and noise immunity. Photonic transducer is interferometer with two arms. Small relative axial motions of mirrors detected as shifts in interference pattern. Version measures temperature changes via differential expansion or contraction of stalks. New transducers smaller (typical size less than 1 cm) and coupled to monitoring equipment with optical fibers instead of wires. Well suited to biomedical instrumentation.

B84-10339
DERIVING STRAIN MODES FROM VIBRATIONAL TESTS
J. W. YOUNG (Structural Dynamics Research Corp.) and J. C. JOANIDES (Rockwell International Corp.)
Apr. 1985
MSC-20587 **Vol. 8, No. 4, P. 521**

Measurements and theoretical analysis complement each other. Experimental acceleration and strain data used to calculate coefficients of low-frequency vibrational modes of object under test. An iterative comparison of experimental and calculated strains give modal model of improved accuracy that predicts strains under operating conditions. Method useful in fatigue life and reliability analyses of buildings, pumps, engines, vehicles, and other systems subject to vibrations and loud noises during operation.

B84-10340
ACTIVE PULSE SUPPRESSION OF STRUCTURAL VIBRATIONS
F. UDWADIA (CALTECH)
Apr. 1985
NPO-15788 **Vol. 8, No. 4, P. 522**

Corrective opposing vibrations reduce Earthquake damage. Algorithm for controlling reactions of buildings and other structures to Earthquake initiates counterpulses when incoming shock pulses exceed threshold level. By using 'go/no-go' criterion rather than continuously adjusting response to every input excitation no matter how small, control system needs less computation effort than comparable closed-loop systems.

B84-10341
CONSTANT-OPERATING-RESISTANCE HOT-WIRE PROBE
P. C. STAINBACK
Apr. 1985
LAR-13144 **Vol. 8, No. 4, P. 523**

Effects of lead-wire-resistance changes with temperature nullified. Constant-operating-resistance hot-wire probe uses two sets of leads. Exposed to identical conditions, comparison of resistance gives change in sensing element itself. Data taken in more convenient manner, with advantage of not having to constantly check for possible changes in lead resistance and consequently readjust potentiometer.

B84-10342
HOT-WIRE PROBE FOR COMPRESSIBLE SUBSONIC FLOW
P. C. STAINBACK, C. B. JOHNSON, and C. B. BASNETT (SDC)
Apr. 1985
LAR-13051 **Vol. 8, No. 4, P. 524**

Probe measures velocity, density, and total temperature fluctuations. Three-wire probe used with each wire operating at different overheat ratio. Technique extendable into transonic and low supersonic flow regimes without difficulty except for those problems usually associated with lengthy calibration and possible wire breaking.

B84-10343
MEASURING THE LIQUID CONTENT OF A GAS
D. H. BEEKMAN (Martin Marietta Corp.) and L. H. METHNER (Martin Marietta Corp.)
Apr. 1985
MFS-25990 **Vol. 8, No. 4, P. 525**

Instrument is adaptation of hot-wire anemometer. Hot-wire anemometer detects liquid droplets entrained in flowing gas. Droplets impinge on probe and carry away heat as vaporized. Power required to maintain probe at constant resistance and elevated temperature gives measure of amount of liquid present. Instrument used in steam turbines to check for condensation and detect fog at airports and highways, generating control signal to turn on fog lights.

B84-10344
CONTINUOUS-FILAMENT ISOGRID COMPOSITE PANEL
J. G. WILLIAMS, R. J. PALMER (McDonnell Douglas Corp.), and A. T. TUCCI (McDonnell Douglas Corp.)
Apr. 1985
LAR-12975 **Vol. 8, No. 4, P. 527**

Damaged panels do not fail catastrophically when fabricated this way. Isogrid stiffener formed in slotted silicon-rubber tool. At grid intersections, slots offset to prevent excessive buildup of composite material and widened to give room for overlapping filaments to spread when compressed. Following total failure of skin, isogrid stiffener still carries 350 kN/m (2,000 lb/in.) and remains intact.

B84-10345
THERMAL-BALANCE STRIP FOR FLUTED LFC PANELS
P. BONO (McDonnell Douglas Corp.)
Apr. 1985
LAR-12991 **Vol. 8, No. 4, P. 527**

Waviness of less than 0.004 inch achieved using titanium strips. Process uses titanium balancing strips to keep waviness within 0.004inch limit. Balancing strips reduce thermal bonding stresses on lower fiberglass fluted sections and placed so fiberglass ends up sandwiched between porous titanium skin and titanium balance strip. Method requires less skill and less labor intensive than composite-wrapped-mandrel method.

B84-10346
SILICONE-RUBBER TOOLING FOR HOLLOW PANELS
F. H. GALLIMORE (McDonnell Douglas Corp.)
Apr. 1985
LAR-12974 **Vol. 8, No. 4, P. 527**

Wave-free contour surface obtained by using flexible mold. Silicone-rubber layup tool, when used in conjunction with hard plastic laminating mold defining desired contour, produces panel with wave-free surface that accurately reproduces shape of mold. In addition to providing porous hollow-panel wing structure that acts as duct for transporting sucked boundary layer tooling, also used to fabricate high-strength lightweight door panels and any single-or compound-contour panel.

B84-10347
QUICK-CHANGE HOLDER FOR AERONAUTICAL-RESEARCH MICROPHONES

R. COHN
Apr. 1985
FRC-11072 **Vol. 8, No. 4, P. 528**
Mounting holds microphone flush with aircraft surface and maintains pressure seal. Microphones, which measure dynamic pressure and shock waves as they pass over aircraft fuselage or other experimental body, mounted through fuselage flush with outside surface. Besides being faster and easier to use than older mounts, new mount prevents damage to microphone on removal because no sealant to be cut and scraped away.

B84-10348
MICROPHONE DETECTS BOILER-TUBE LEAKS
S. P. PARTHASARATHY (CALTECH)
Apr. 1985
NPO-16027 **Vol. 8, No. 4, P. 529**
Unit simple, sensitive, rugged, and reliable. Diaphragmless microphone detects leaks from small boiler tubes. Porous plug retains carbon granules in tube while allowing pressure changes to penetrate to granules. Has greater life expectancy than previous controllers and used in variety of hot corrosive atmospheres.

B84-10349
IN-PLACE CALIBRATION OF INSTRUMENTATION MICROPHONES
R. B. COHN (Dryden Flight Research Facility)
Apr. 1985
ARC-11463 **Vol. 8, No. 4, P. 530**
Accidental damage and decalibration prevented. Linearity, sensitivity, and frequency response of microphone measured with commercial sound generator modified so placed directly over or under microphone. Artificial voice connected to oscillator and measuring amplifier. Requisite frequencies and sound pressures applied to microphone, and microphone output recorded. New calibration method used on aircraft and wind-tunnel microphones.

B84-10350
SYNCHRONOUSLY DEPLOYABLE TRUSS
H. G. BUSH, M. K. MIKULAS JR., and R. E. WALLSOM (Kentron International, Inc.)
Apr. 1985
LAR-13117 **Vol. 8, No. 4, P. 531**
Double-layered truss structure compactly packaged and sychronously deployed. Synchronously deployable truss constructed of two surface layers of struts, arranged in triangles, connected by 'tripods' of equal-length core struts. Mechanism powered by passive spring and damped by hydraulic-damping cylinder. When released, spring drives slider linked to core and surface struts. Variety of truss geometries, including curved structures, comtemplated.

B84-10351
DEPLOYABLE GEODESIC TRUSS
M. M. MIKULAS JR., M. D. RHODES, and J. W. SIMONTON
Apr. 1985
LAR-13113 **Vol. 8, No. 4, P. 532**
Efficiently packaged structure deployed or retracted easily. In preliminary two-bay model each bay has sets of battens connected by two longitudinal crossed members that give bay axial and torsional stiffness. Cross-members hinged in center to fold for packaging. Bays deployed and stabilized by actuators connected between center hinges of cross-members.

B84-10352
ADJUSTABLE MOUNT
E. A. CROSSLEY, H. C. JONES, D. P. HAYNES, and I. W. JONES
Apr. 1985
LAR-13100 **Vol. 8, No. 4, P. 534**
Remotely-controlled adjustable mount operates in vacuum environments. Mount consists of jacking-screw arrangement to control vertical direction. Gear-driven lead screw controls other horizontal direction, while rack-and-pinion gears control azimuth and pitch. Adjustments made independently of each other.

B84-10353
GAS-DENSITY GAGE
W. BERNSTERIN (William Marsh Rice University) and J. MCGARITY (William Marsh Rice University)
Apr. 1985
MFS-28011 **Vol. 8, No. 4, P. 534**
Lightweight density gage that operates over broad pressure range accurately measures gas pressures.

B84-10354
CAPTURE-RANGE INDICATOR
C. HELLER
Apr. 1985
MFS-28008 **Vol. 8, No. 4, P. 534**
Position indicator allows rapid positioning and linkage of payloads. Device shortens capture time and provides less-stressful linkage on operator.

B84-10355
MEASURING CLEARANCE INDIRECTLY
W. C. JOHNSON (Rockwell International Corp.) and B. O. WESTBERG (Rockwell International Corp.)
Apr. 1985
MFS-19875 **Vol. 8, No. 4, P. 534**
Plot of deflection versus load indicates clearance between internal pins and wall.

07 MACHINERY

B84-10146
STEPPED-PIN CLEVIS RESISTS JAMMING
T. O. KILLGROVE (CALTECH)
Jan. 1985
NPO-15834 **Vol. 8, No. 3, P. 395**
Pin modification allows pyrotechnic release devices to operate more smoothly. New clevis pin has stepped diameters to prevent bending as it exits yoke. In contrast, conventional unstepped clevis pin bends and jams as it is withdrawn. Stepped pin design suitable for explosive and possible hammer driven pin sullers.

B84-10147
FORKLIFT SUPPORT DOLLY
W. YOUNG (A. & M. Machine Co.) and H. C. WITCHER
Jan. 1985
GSC-12916 **Vol. 8, No. 3, P. 396**
Long, heavy loads handled safely. Forklift support dolly enables operator to manipulate safely large sections of materials around corners and through narrow aisles and doorways. Dolly has pivoting tandem wheels for maneuverability. Plate laid out lengthwise along truck axis, with one end clamped to forklift and other end clamped to dolly. With this arrangement, minimum width of passage determined by short side of plate rather than by long side.

B84-10148
FASTER RESPONSE FOR MEMORY-METAL ACTUATORS
C. F. RUOFF (CALTECH)
Jan. 1985
NPO-16120 **Vol. 8, No. 3, P. 396**
Cooling accelerated by attaching Peltier junction. Electric current carries heat to or from junction between two dissimilar metals, direction of heat flow depending on direction of current and particular metals used. Direction of

current is opposite to that of same two metals operating as thermocouple.

B84-10149
SEALING MECHANICAL CRYOGENIC COOLERS
R. RICHTER (CALTECH)
Jan. 1985
NPO-15139 **Vol. 8, No. 3, P. 397**
Metal bellows used to seal Vuilleumier and Stirling-cycle cryogenic coolers, replacing sliding seals that failed after only 3,000 hours of service. Metal bellows, incorporated in displacer design provide nonrubbing dynamic seal. Lifetime of cryogenic cooler no longer limited by loss of sealing material and by deterioration of regenerators due to clogging by seal debris.

B84-10150
VACUUM SEAL PERMITS LIMITED ROTATION
F. LOMBARDI (CALTECH)
Jan. 1985
NPO-15115 **Vol. 8, No. 3, P. 398**
Flexible metal seal permits rotation of object in vacuum chamber. Seal made from two cylindrical azimuthally fluted bellows attached to ends of cylindrical axially fluted bellows with connecting tubes at both ends. Designed for rotation of sample probes in electron spectroscopy for chemical analysis (ESCA), other applications likely.

B84-10151
AUTOMATIC COAL-MINING SYSTEM
E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15861 **Vol. 8, No. 3, P. 398**
Coal cutting and removal done with minimal hazard to people. Automatic coal mine cutting, transport and roof-support movement all done by automatic machinery. Exposure of people to hazardous conditions reduced to inspection tours, maintenance, repair, and possibly entry mining.

B84-10152
THE EFFECT OF WIND ON THE AERODYNAMIC RESISTANCE OF HIGHWAY VEHICLES
B. DAYMAN JR. (CALTECH)
Jan. 1985
NPO-14771 **Vol. 8, No. 3, P. 399**
CARYAW predicts effects of wind on aerodynamic resistance of vehicles. Determines effect of winds on fuel consumption and determines effects of vehicle speed on fuel consumption for wide variety of wind conditions.

B84-10153
STANDARD FASTENER LIBRARY
J. J. TEJWANI (Rockwell International Corp.), T. R. KELLY (Rockwell International Corp.), and M. L. MARKE (Rockwell International Corp.)
Jan. 1985
MSC-20645 **Vol. 8, No. 3, P. 400**
Program for use with graphics system creates library of standard fastener hardware. Programs categorized by fastener geometric shape with tabulated sizes. Fastener details recalled by configuration and size for insertion into drawing on screen. Program used in production of engineering drawings for Space Shuttle orbiter.

B84-10154
AERODYNAMIC DESIGN OF ROAD VEHICLES
D. W. KURTZ (CALTECH)
Jan. 1985 See Also NASA CR-163744 (N81-12943/NSP)
NPO-15474 **Vol. 8, No. 3, P. 400**
Guidebook discusses design of road vehicles to reduce aerodynamic drag. Book presents strategy for integrating aerodynamic design into vehicle design. Book written for readers lacking experience in aerodynamics.

B84-10155
INEXPENSIVE PRESSURE-RELIEF VALVE
E. A. THEORDORE (Rockwell International Corp.)
Jan. 1985
MSC-20518 **Vol. 8, No. 3, P. 400**
Simple device vents excess low-pressure gas. Inexpensive pressure relief valve built from polyvinylchloride pipe. Valve suitable for low pressure-- 25 to 50 cm of mercury--and flow rates up to 14 m3/min.

B84-10156
BOLT INSERTS FOR LIGHTNING PROTECTION
K. O. HAMBROCK (Martin Marietta Corp.)
Jan. 1985
MFS-25918 **Vol. 8, No. 3, P. 400**
Stainless steel bolt fasteners have adequate grounding paths for protection of structures against lightning strikes. Fasteners particularly useful in sections where insulating material required, such as thermal panels of external storage tank.

B84-10157
SOLAR-POWERED FLYWHEEL
F. J. NOLA
Jan. 1985
MFS-25978 **Vol. 8, No. 3, P. 400**
Energy-storage system has 20 year lifetime. Electrical power source consisting of flywheel and electronic control system stores solar energy. Flywheel developed for space vehicles features good weight-to-energy storage ratios and used as control gyroscope for maneuvering.

B84-10158
CLAMP SECURES MATERIAL TO CYLINDER BASE
Y. S. TAM (Rockwell International Corp.)
Jan. 1985
MFS-19479 **Vol. 8, No. 3, P. 400**
Two-part clamp assembled around pipe or post, ends not free. Resistance welding clamp to post and locking ring to lower part of clamp permanently fixes clamp in place, preventing thermal cycling from loosening clamp.

B84-10159
REMOTELY OPERATED GRIPPER TRACKS APPLIED FORCE
G. C. BURNS (McDonnell Douglas Corp.)
Jan. 1985
MSC-20241 **Vol. 8, No. 3, P. 401**
Operator 'feel' incorporated into new design. Remotely controlled gripper grasps holds, and maneuvers items not equipped with grapple fixture and no preplanned interface with gripper.

B84-10160
PILLAR-TRIMMING SYSTEM
E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15848 **Vol. 8, No. 3, P. 401**
Trimming and reinforcing of coal pillars allows more coal recovery. Conceptual coal-pillar trimming machine use two counterrotating cutting drums to take corners off roof support pillars in coal mines.

B84-10161
PERFORMANCE TESTING OF THE DOE ELECTRIC TEST VEHICLE
D. W. KURTZ (CALTECH), J. A. BRYANT (CALTECH), and T. W. PRICE (CALTECH)
Jan. 1985
NPO-15660 **Vol. 8, No. 3, P. 401**
Report describes total system testing and evaluation of electrically powered automobile.

B84-10162
INERT-GAS ELECTRICAL DISCHARGE MACHINING
V. RAMANI (Rockwell International Corp.) and M. L.

CASSIDENTI (Rockwell International Corp.)
Jan. 1985
MFS-19778 **Vol. 8, No. 3, P. 401**
Holes in complicated hardware successfully drilled by dry EDM process that uses tubular copper electrode and argon or helium gas as dielectric medium.

B84-10163
COUNTERSINK DRILL
R. J. HERNANDEZ (Rockwell International Corp.)
Jan. 1985
MFS-19852 **Vol. 8, No. 3, P. 401**
Efficient drill design for countersinking or metal drilling uses only two flutes instead of three and made of carbide instead of 'high-speed' steel. Tool performance and service life increased.

B84-10164
TWO-PHASE WET/DRY ENGINE FOR WASTE-HEAT RECOVERY
D. G. ELLIOTT (CALTECH)
Jan. 1985
NPO-15621 **Vol. 8, No. 3, P. 401**
Novel supersonic fluid expansion nozzle used to vaporize toluene (or other drying-type organic liquid) by expansion through two-phase region to drive impulse turbine in Rankine-cycle engine.

B84-10165
KICK-FREE PRESSURE RELEASE VALVE
T. O. KILLGROVE (CALTECH)
Jan. 1985
NPO-16078 **Vol. 8, No. 3, P. 402**
Release valve for smoothly venting buildup of gas pressure modified to reduce kickback of mechanism during discharge.

B84-10166
MAGNETIC DESPINNING SYSTEM
G. F. VON TIESENHAUSEN
Jan. 1985
MFS-25966 **Vol. 8, No. 3, P. 402**
Electrical coil reduces spinning and tumbling speed of orbiting satellites through eddy-current braking. Induction of eddy currents into skin of satellite by electromagnetic field produces torques that oppose rotation.

B84-10167
MEMORY-METAL STEPPING MOTOR
R. S. JAMIESON (CALTECH)
Jan. 1985
NPO-15482 **Vol. 8, No. 3, P. 402**
Compact stepping motor for applications requiring high torque at slow speeds made with helical spring clutch and electrically-heated memory-metal actuator.

B84-10168
DIVERTER LIP FOR SEAL
E. JACKSON III (Rockwell International Corp.) and D. JOHNSON (Rockwell International Corp.)
Jan. 1985
MFS-19891 **Vol. 8, No. 3, P. 402**
Proposed one-piece design change for cooling turbine rotor disks eliminates temperature differential that normally causes thermal stresses and cracks.

B84-10169
MEASURING THE RUNOUT ON A ROTARY SHAFT
R. BEATTY (Rockwell International Corp.) and J. FENWICK (Rockwell International Corp.)
Jan. 1985
MFS-19694 **Vol. 8, No. 3, P. 402**
Runout on shaft such as on pump shaft in liquid oxygen environment measured by device employing pair of pistons placed 90 degrees apart and in contact with shaft.

B84-10356
SAFETY PEDAL FOR FOOT-OPERATED MACHINERY
G. D. GARCIA (Rockwell International Corp.)
Apr. 1985
MSC-20535 **Vol. 8, No. 4, P. 537**
Ninged structure prevents inadvertent use. Forward motion of foot on yoke plate necessary to operate brake pedal. Downward force on yoke plate turns locking/releasing laver, which then pushes locking pin into indexing hole. New pedal improves both productivity and safety of power brakes and such other machines as metal shearers and punch presses.

B84-10357
BRIDLE ATTACHMENT FOR AIRCRAFT SPIN-RECOVERY PARACHUTE
W. L. WHITE
Apr. 1985
LAR-13076 **Vol. 8, No. 4, P. 538**
Antispin rolling moment produced by chute drag force. Parachute stowed prior to deployment. At deployment, bridle attachment produces antispin rolling moment. At recovery, parachute forces are in aircraft plane of symmetry. Attachment system reduces parachute diameter typically required for spin recovery of experimental aircraft during harzardous flight testing.

B84-10358
COMPACT ANTISPIN PARACHUTE SYSTEM
R. D. WHIPPLE
Apr. 1985
LAR-12979 **Vol. 8, No. 4, P. 539**
Costs and complexity of parachute system greatly reduced. Rigid towline parachute system operates in three steps: (1) When aircraft begins to spin, parachute compartment opened up, and parachute unfolds; (2) Parachute deployed and spin terminated; and (3) Parachute released. Advantage of towline system allows use of much smaller parachute, reducing design loads on structural reinforcement. Also, complex pyrotechnic-deployment or jettison systems no longer necessary.

B84-10359
GARTER VALVES
P. JENCEK (Rockwell International Corp.)
Apr. 1985
MFS-19899 **Vol. 8, No. 4, P. 540**
Small subvalves opened and closed simultaneously. Precisely-machined mating rings act as valves. Rings seal against each other to stop fluid flow. Rings deformed or moved relative to each other to uncover holes and permit flow. Valve controls flow rate of fuel into burner.

B84-10360
DEGREASER REDUCES SOLVENT LOSS
E. R. DU FRESNE (CALTECH)
Apr. 1985
NPO-16128 **Vol. 8, No. 4, P. 541**
Escape of solvent minimized by second cooling coil. Degreaser suppresses solvent-vapor loss through parts-basket dragout and air drafts. Within CO2 blanket, convection repeatedly exposes CO2/solvent mixture to cold spot created by CO2 coil. Solvent vapor condenses, then runs down via through to cold tank. This small expenditure of CO2 minimizes health and environmental hazards.

B84-10361
TAPERED RING SEAL
D. P. FLEMING
Apr. 1985 See Also NASA TP-1646 (N80-19495/NSP)
LEW-10455 **Vol. 8, No. 4, P. 541**
Centering force maximized by decreased seal clearance in flow direction. Increased centering force prevents contact between seal and shaft, eliminating seal wear. Ring seals used to restrict fluid leakage between rotating shaft and

nonrotating housing. Seal used in Space Shuttle main engine oxygen pump.

B84-10362
REACTIONLESS WINCH
B. E. BOSWELL (McDonnell Douglas Corp.)
Apr. 1985
MSC-20440 **Vol. 8, No. 4, P. 542**

Hand-held tool serves variety of uses. Housing of Winch includes simple controls and reaction handle that serves as stowage for ratchetingcrank handle. Winch used by divers working underwater. Also used for pulling vehicles out of mud, lifting heavy objects, or tightening cables.

B84-10363
REMOTE COUPLING OF ELECTRICAL CONNECTORS
R. T. BARBOUR (Rockwell International Corp.)
Apr. 1985
MSC-20414 **Vol. 8, No. 4, P. 543**

Device alines plug and receptacle axially and radially. Standard multiple-pin plug and socket mounted in mechanism. As threaded shaft moves out from its mounting bracket, two sets of petals engage each other and correct misalinement. Misalinement absorbed by spring-mounted swivels. Designed for umbilical cables between Space Shuttle and payload, mechanism adaptable to other remote or hazardous situations in which human not available to connect mating parts by hand.

B84-10364
TOOL FOR INSERTING AND REMOVING TUBE PLUGS
O. G. MOLINA (Rockwell International Corp.) and A. G. PASCUA (Rockwell International Corp.)
Apr. 1985
MFS-19871 **Vol. 8, No. 4, P. 544**

Simple handtool used with both straight and bent tubes. Plug consisting of two expandable O-rings pushed into or pulled out of tube with this flexible tool. Flexible shaft of tool threaded at inner (plug) end to engage or disengage plug when knurled handle turned. Results exceptionally low friction between shaft and tube. Allows insertion and removal of plug carefully controlled.

B84-10365
IGNITION-SPARK DETECTOR FOR ENGINE TESTING
G. KUHR (Rockwell International Corp.)
Apr. 1985
MFS-19890 **Vol. 8, No. 4, P. 544**

Optical fiber views sparks directly. In fuel or oxidizer tube, optical fiber collects light from ignition spark. Fibers also used to collect light from combustion reactions for spectrographic analysis. Useful in engine testing, detector helps determine reason for engine failure.

B84-10366
HINGED SHIELDS FOR MACHINE TOOLS
J. B. LALLANDE, W. W. POLAND, and S. TULL
Apr. 1985
GSC-12915 **Vol. 8, No. 4, P. 545**

Flaps guard against flying chips, but fold away for tool setup. clear plastic shield in position to intercept flying chips from machine tool and retracted to give operator access to workpiece. Machine shops readily make such shields for own use.

B84-10367
HOLDING CARGO IN PLACE WITH FOAM
T. T. FISHER (Lockheed Missiles & Space Co., Inc.)
Apr. 1985
MSC-20723 **Vol. 8, No. 4, P. 546**

Foam fills entire container to protect cargo from shock and vibration. Originally developed for stowing space debris and spent satellites in Space Shuttle for return to Earth, encapsulation concept suitable for preparing shipments carried by truck, boat, or airplane. Equipment automatically injects polyurethane foam into its interior to hold cargo securely in place. Container of rectangular or other cross section built to match shape of vehicle used.

B84-10368
AUTOMATIC ROBOT SAFETY SHUTDOWN SYSTEM
M. LIRETTE (Martin Marietta Corp.)
Apr. 1985
MFS-25969 **Vol. 8, No. 4, P. 546**

Robot turned off if acceleration exceeds preset value. Signals from accelerometer on robot arm pass through filter and amplifier, eliminating high-frequency noise and hydraulic-pump pulsations. Data digitized and processed in computer. Unit controls other machines that perform repetitive movements, including rotary tables, tracked vehicles, conveyor lines, and elevators.

B84-10369
EDM ELECTRODE FOR INTERNAL GROOVES
V. RAMANI (Rockwell International Corp.) and A. WERNER (Rockwell International Corp.)
Apr. 1985
MFS-19733 **Vol. 8, No. 4, P. 547**

Electroerosive process inexpensive alternative to broaching. Hollow brass electrodes, soldered at one end to stainless-steel holding ring, held in grooves in mandrel. These electrodes used to machine grooves electrically in stainless-steel tube three-eights inch (9.5 millimeters) in diameter. Tool used on tubes already in place in equipment.

B84-10370
SETUP AID FOR ELECTRICAL-DISCHARGE MACHINING
G. LINES (Rockwell International Corp.) and J. DUCA (Rockwell International Corp.)
Apr. 1985
MFS-19874 **Vol. 8, No. 4, P. 548**

Interlock assures that workpiece is correctly assembled in machining fixture. A Plunger in a Hollow Shaft actuates a switch, allowing a power supply to produce current for electrical-discharge machining. Plunger operates only when necessary parts are position.

B84-10371
PROPELLER DESIGN PROGRAM
W. H. PHILLIPS
Apr. 1985
LAR-13141; LAR-13142 **Vol. 8, No. 4, P. 548**

Planform and propeller twist with minimum induced loss calculated. New Theoretical treatment combines classical theories of Betz-Prandtl, Goldstein, and Glauert easily applied to problem of determining propeller blade geometry for minimum induced loss. Analysis applicable at subsonic flight speeds and neglects structural considerations in propeller design.

B84-10372
HYBRID-VEHICLE TRANSMISSION SYSTEM
G. LUPO (Centro Ricerche Fiat S.p.A.) and G. DOTTI (Centro Ricerche Fiat S.p.A.)
Apr. 1985
NPO-16119 **Vol. 8, No. 4, P. 549**

Continuously-variable transmission system for hybrid vehicles couples internal-combustion engine and electric motor section, either individually or in parallel, to power vehicle wheels during steering and braking.

B84-10373
EVENING FLOW DISTRIBUTION THROUGH PARALLEL TUBES
S. C. BRAY (General Electric Co.), P. W. DIETZ (General Electric Co.), and H. JASTER (General Electric Co.)
Apr. 1985
MFS-23936 **Vol. 8, No. 4, P. 549**

Flow nonuniformity in parallel tubes reduced by introducing pressure drops. Total flow maintained and controlled by varying main inletvalve position.

B84-10374
LINEAR BOOM ACTUATOR
E. F. KOCH (CALTECH)
Apr. 1985
NPO-16099 **Vol. 8, No.4, P. 550**
Actuator stabilizes spacecraft spin by varying length of support struts that hold spacecraft booms. Variation changes spin axis and controls wobble. Linear actuator controls spacecraft wobble applicable in rotating systems on Earth.

B84-10375
SAFETY EVALUATION METHODOLOGY FOR MINING SYSTEMS
W. F. ZIMMERMAN (CALTECH)
Apr. 1985
NPO-15831 **Vol. 8, No. 4, P. 550**
Methodolgy evaluates design of proposed mining systems. Analysis tests proposed mining systems against specifications and hazards of existing similar systems, examines soundness of new design in terms of reducing or eliminating major health and safety hazards, and identifies major design weaknesses.

B84-10376
HIGH-TEMPERATURE PUMP
R. R. HALE (CALTECH) and A. R. MCDOUGAL (CALTECH)
Apr. 1985
NPO-15783 **Vol. 8, No. 4, P. 550**
Heat exchanger in water-cooled pumps allows high-temperature operation.

B84-10377
POWER TRAIN FOR HYBRID ELECTRIC VEHICLE
H. C. VIVIAN (CALTECH)
Apr. 1985
NPO-15742 **Vol. 8, No. 4, P. 550**
Power train of hybrid electric vehicle enables internal-combustion engine and electric motor to operate near same constant speed except when off or idling.

B84-10378
ADJUSTABLE TUNING SPRING FOR BELLOWS PUMP
G. L. GREEN (Pan American World Airways, Inc.), D. TU DUC (Pan American World Airways, Inc.), and S. HOOPER (Pan American World Airways, Inc.)
Apr. 1985
MSC-20512 **Vol. 8, No. 4, P. 550**
Adjustable leaf spring increases maximum operating pressure of pump from 2 to over 60 psi (13 to over 400 kN/m2). Small commercial bellows pump using ac-powered electromagnet to vibrate bellows at mechanical resonance modified to operate over wider pressure range.

08 FABRICATION TECHNOLOGY

B84-10170
TWO-CRUCIBLE CZOCHRALSKI PROCESS
G. FIEGL (Siltec Corp.) and W. TORBET (Siltec Corp.)
Jan. 1985
NPO-15110 **Vol. 8, No. 3, P. 405**
Scheme for continuous melt replenishment increases capacity of Czochralski crystal-growing furnace. Replenishing and drawing crucibles of improved Czochralski apparatus connected by heated quartz siphon. When doped silicon added to replenishing crucible, liquid silicon flows into drawing crucible, equalizing two melt levels. Addition of new material automatically controlled in response to optically sensed melt level. Results of this semicontinuous operation higher production speed, lower cost, and good control of crystal quality.

B84-10171
RECIPROCATING SAW FOR SILICON WAFERS
A. D. MORRISON (CALTECH) and E. R. COLLINS JR. (CALTECH)
Jan. 1985
NPO-15863 **Vol. 8, No. 3, P. 406**
Concept increases productivity and wafer quality. Cutting wafers from silicon ingots produces smooth wafers at high rates with reduced blade wear. Involves straight reciprocating saw blade and slight rotation of ingot between cutting strokes. Many parallel blades combined to cut many wafers simultaneously from ingot.

B84-10172
PRODUCTION LINE FOR DENDRITIC-WEB SOLAR CELLS
D. J. PAGE (Westinghouse Electric Corp.)
Jan. 1985
NPO-15098 **Vol. 8, No. 3, P. 407**
Direct inclusion of web-growth furnaces in production line expected to result in lower costs than current production processes using silicon wafers sliced from Czochralski boules. Silicon-web input capacity of line is 0.5 m2/min, which corresponds to total peak-power output of about 25 MW for 1 year of production. Line employs about 18 production people per shift and requires about 3,650 square feet of floorspace.

B84-10173
MACHINING OF SILICON-RIBBON-FORMING DIES
A. A. MENNA (Mobil Tyco Solar Energy Corp.)
Jan. 1985
NPO-15127 **Vol. 8, No. 3, P. 408**
Carbon extension for dies used in forming silicon ribbon crystals machined precisely with help of special tool. Die extension has edges beveled toward narrow flats at top, with slot precisely oriented and centered between flats and bevels. Cutting tool assembled from standard angle cutter and circular saw or saws. Angle cutters cuts bevels while slot saw cuts slot between them. In alternative version, custom-ground edges or additional circular saws also cut flats simultaneously.

B84-10174
AUTOMATICALLY DRESSING BLADES IN SILICON-WAFER CUTTING
A. D. MORRISON (CALTECH)
Jan. 1985
NPO-15745 **Vol. 8, No. 3, P. 408**
Inserts incorporated in support beams for silicon ingots automatically 'dress' cutting blade during wafer slicing. Segments of blade-dressing material placed at regular intervals in graphite beam. Blade cuts into segments and dressed without operator intervention and without interrupting regular machine operation. Manual dressing eliminated, and production rates increased.

B84-10175
HIGH-MOBILITY EPITAXIAL SILICON WAFERS
R. STERMER JR., A. FRIPP JR., A. JONES (Rockwell International Corp.), J. MCMULLEN (Rockwell International Corp.), H. MANASEVIT (Rockwell International Corp.), I. GERGIS (Rockwell International Corp.), and S. SOCLOF (Rockwell International Corp.)
Jan. 1985
LAR-12846 **Vol. 8, No. 3, P. 409**
New technique produces high-mobility multilayer films suitable for use on silicon process line. New material is multilayer film of alternate layers of silicon and alloy of silicon and germanium. Films grown thus far have electron mobilities 50 percent greater than epitaxial silicon films grown previously.

B84-10176
RAPID ADHESIVE BONDING FOR METALS AND COMPOSITES
B. A. STEIN, J. R. TYERYAR, R. L. FOX, S. E. STERLING JR., and J. D. BUCKLEY
Jan. 1985
LAR-13066 **Vol. 8, No. 3, P. 410**

Toroidal induction heater is key element in rapid bonding technique. Rapid adhesive bonding equipment features toroid induction heater for quick bonding of composites and metals. Process avoids damaging composites that cannot withstand high temperatures for long time intervals. Process scaled up for production. Technique suited to bonding of end tabs onto material test specimens.

B84-10177
COLLAPSIBLE AND DEPLOYABLE TRUSSES
R. A. NELSON (Vought Corp.)
Jan. 1985
MFS-25945 **Vol. 8, No. 3, P. 411**

Cable-controlled mechanisms allow large structures stored in small spaces. Combination of telescoping struts and pivot points allows very large structure collapsed into very small one. Concept used not only for straight but for tapered or curved ones as well. Structure adaptable to terrestrial uses as portable towers, scaffolds, and bridge beams folded compactly for transportation or storage.

B84-10178
HOT-DIPPED METAL FILMS AS EPITAXIAL SUBSTRATES
P. J. SHLICHTA (CALTECH)
Jan. 1985
NPO-15904 **Vol. 8, No 3, P. 412**

Multistep process forms semiconductor devices on macrocrystalline films of cadmium or zinc. Solar-cell fabrication processes use hot-dipped macrocrystalline films on low-cost sheet-metal base as substrates for epitaxy. Epitaxial layers formed by variety of methods of alternative sequence paths. Solar cells made economically by forming desired surface substance directly on metal film by chemical reactions.

B84-10179
DECONTAMINATING ALUMINUM/AMMONIA HEAT PIPES
J. A. JONES (CALTECH)
Jan. 1985
NPO-16066 **Vol. 8, No. 3, P. 413**

Internal gas slugs reduced or eliminated. Manufacturing method increases efficiency of aluminum heat pipes in which ammonia is working fluid by insuring pipe filled with nearly pure charge of ammonia. In new process heat pipe initially closed with stainless-steel valve instead of weld so pipe put through several cycles of filling, purging, and accelerated aging.

B84-10180
POLYURETHANE MASKS LARGE AREAS IN ELECTROPLATING
J. L. BEASLEY (Rockwell International Corp.)
Jan. 1985
MFS-19825 **Vol. 8, No. 3, P. 413**

Polyurethane foam provides effective mask in electroplating of copper or nickel. Thin layer of Turco maskant painted on area to be masked: Layer ensures polyurethane foam removed easily after served its purpose. Component A, isocyanate, and component B, polyol, mixed together and brushed or sprayed on mask area. Mixture reacts, yielding polyurethane foam. Foam prevents deposition of nickel or copper on covered area. New method saves time, increases productivity and uses less material than older procedures.

B84-10181
VENTED COMPRESSION MOLDING OF GRANULE-FILLED RESINS
J. O. MCCREE (Martin Marietta Aerospace Corp.) and L. ERWIN (Martin Marietta Aerospace Corp.)
Feb. 1985
MFS-25975 **Vol. 8, No. 3, P. 414**

Resins filled with granules formed to final size and shape in new process. New vented compression molding method takes less time than conventional method. Vacuum-bagging and machining stages eliminated. Part emerges from mold in final size and shape. Suitable for making variety of parts with simple shapes, vented compression molding takes less time and cost less than older processes.

B84-10182
ALINING HEAT-EXCHANGER TUBES FOR ASSEMBLY
K. A. BENSON (Rockwell International Corp.)
Feb. 1985
MFS-19857 **Vol. 8, No. 3, P. 415**

Simple support method makes costly jigs and fixtures unnecessary. 'Dummy' tubes installed at regular intervals to support 'real' tubes before real tubes installed, filled with Cerrobend (or equivalent) material, metallic substance with low melting point, makes dummy tubes rigid so they brace real tubes as installed. When all available spaces for real tubes filled, dummy tubes removed and replaced with real tubes.

B84-10183
BEAM-CAP-FORMING MACHINE
W. MARX (Grumman Aerospace Corp.)
Feb. 1985 See Also CR-170642 (N83-11158/NSP)
MFS-27007 **Vol. 8, No. 3, P. 415**

Graphite reinforced plastic strip transformed into continuous beam cap. Report describes machine that fabricates beam caps from graphite reinforced thermoplastic materials supplied as strip stock.

B84-10184
MATCHING IMPEDANCES AND MODES IN ACOUSTIC LEVITATION
M. B. BARMATZ (CALTECH)
Feb. 1985
NPO-16022 **Vol. 8, No. 3, P. 416**

Temperature differences accommodated with tunable coupler. Report discusses schemes for coupling sound efficiently from cool outside atmosphere into hot acoustic-levitation chamber. Theoretical studies have practical implications for material-processing systems that employ acoustic levitation.

B84-10185
ACOUSTIC LEVITATION WITH ONE DRIVER
T. G. WANG (CALTECH), I. RUDNICK (CALTECH), D. D. ELLEMAN (CALTECH), and J. D. STONEBURNER (CALTECH)
Feb. 1985
NPO-15793 **Vol. 8, No. 3, P. 416**

Report discusses acoustic levitation in rectangular chamber using one driver mounted at corner. Placement of driver at corner enables it to couple effectively to acoustic modes along all three axes. Use of single driver reduces cost, complexity and weight of levitation system below those of three driver system.

B84-10186
PRICE ESTIMATION GUIDELINES
R. G. CHAMBERLAIN (CALTECH), R. W. ASTER (CALTECH), P. J. FIRNETT (CALTECH), and M. A. MILLER (CALTECH)
Feb. 1985
NPO-15569 **Vol. 8, No. 3, P. 417**

Improved Price Estimation Guidelines, IPEG4, program provides comparatively simple, yet relatively accurate estimate of price of manufactured product. IPEG4 processes user supplied input data to determine estimate of price per unit of production. Input data include equipment cost, space required, labor cost, materials and supplies cost, utility

expenses, and production volume on industry wide or process wide basis.

B84-10187
ASSEMBLY-LINE MANUFACTURING INDUSTRY SIMULATION
R. G. CHAMBERLAIN (CALTECH) and P. J. FIRNETT (CALTECH)
Feb. 1985
NPO-16032 **Vol. 8, No. 3, P. 417**
Assists in economic analysis of production line manufacturing. Originally developed to estimate product price received by hypothetical U.S. industry that manufactures silicon solar modules for use in electricity generation, SAMIS extended and generalized to extent that it simulates operation of many different production line manufacturing industries and/or companies.

B84-10188
TWO-PULSE STITCH WELDING
C. J. TORBORG (Honeywell, Inc.)
Feb. 1985
MFS-25716 **Vol. 8, No. 3, P. 418**
Second welding pulse at about 20 percent higher energy repairs bad single-pulse welds. Method used successfully to weld polytetrafluoroethyleneinsulated nickel wire to stainless-steel terminals in back-plane wiring.

B84-10189
SONICALLY-WELDED THERMAL BLANKETS
R. BETTINI (The Perkin-Elmer Corp.) and F. CITRIN (The Perkin-Elmer Corp.)
Feb. 1985
MFS-25806 **Vol. 8, No. 3, P. 418**
Insulating layers joined by seams. Sonic welding saves time and reduces weight. Layers of blanket built up from alternating layers of polyester sheet and polyester net. Paper pattern showing lines along which layers are joined together placed over top layer.

B84-10190
FABRICATION OF THICK GOLD STRIP LINES
C. M. GEE (Hughes Aircraft Co.), H. L. GARVIN (Hughes Aircraft Co.), and K. ROBINSON (Hughes Aircraft Co.)
Feb. 1985
NPO-16238 **Vol. 8, No. 3, P. 418**
Ion-beam etching and masking techniques fabricate micron-sized gold strip lines. Fabricated by use of argon ion-beam milling.

B84-10191
MAGNETIC CHUCK FOR PRECISE GRINDING
R. A. CARVER (Rockwell International Corp.)
Feb. 1985
MFS-19764 **Vol. 8, No. 3, P. 418**
Handling time substantially reduced. Magnetic grinding chuck used for fabricating parts that have thin, delicate geometrics requiring close tolerances.

B84-10192
IMPROVED MELT-LEVEL CONTROL SYSTEM
D. L. MEIER (Westinghouse Electric Corp.)
Feb. 1985
NPO-15900 **Vol. 8, No. 3, P. 418**
Laser feedback control automatically maintains silicon melt levels. During long-term growth of dendritic-web silicon, silicon melt level controlled and held nearly constant using laser feedback system to sense level of melt and control silicon-pellet feed rate.

B84-10193
SILICON-WEB-GROWING MACHINE
C. DUNCAN (Westinghouse Electric Corp.)
Feb. 1985
NPO-15870 **Vol. 8, No. 3, P. 418**
Silicon replenished automatically as web is withdrawn. Semiautomatic silicon-web-growing machine set down in detailed engineering drawings. Melt level sensed with He/Ne laser beam and melt-level error signal used to control motor-driven pellet feeder, speeding up when level is low. System reduces demand upon operator's time.

B84-10194
MINIMIZING CONVECTION DURING CRYSTAL GROWTH
P. J. SHLICHTA
Feb. 1985
NPO-15811 **Vol. 8, No. 3, P. 419**
Buoyant convection during crystal growth from solution minimized in experiment cell using boundary-layer stabilizing configurants such as downward isothermal growth or upward growth into thermal gradient.

B84-10195
AUTOMATED TEXTURIZATION OF SILICON WAFERS
S. CHITRE (Photowatt International, Inc.), C. SNYDER (Photowatt International, Inc.), G. JONES (Photowatt International, Inc.), and P. MARLOWE (Photowatt International, Inc.)
Feb. 1985
NPO-15816 **Vol. 8, No. 3, P. 419**
Two-stage texturization of either single-crystal or polycrystalline wafers improves conversion efficiency of finished solar cells.

B84-10196
RECIPROCATING CRYSTALLIZER
R. B. LAL (Alabama A & M University) and M. AGGARWAL (Alabama A & M University)
Feb. 1985
MFS-25948 **Vol. 8, No. 3, P. 419**
Automatic crystallizer grows crystals from aqueous solutions. Crystals grown from aqueous solutions by slow cooling of growth solution along with forced convection to increase mass transfer.

B84-10197
IMPURITY EFFECTS ON DENDRITIC GROWTH
M. E. GLICKSMAN (Rensselaer Polytechnic Institute)
Feb. 1985
MFS-25672 **Vol. 8, No. 3, P. 419**
Measurements of effects of soluble impurity addition on dendritic growth rates and morphology allow testing of theoretical dendritic growth models.

B84-10198
ACOUSTIC SORTER FOR SMALL PARTS
T. G. WANG (CALTECH) and E. W. LEUNG (CALTECH)
Feb. 1985
NPO-15913 **Vol. 8, No. 3, P. 419**
Sorting system uses acoustic reasonance chamber, detects, and rejects anomalous parts on automated assembly line. System particularly suited to small nuts, bolts, pins, and assemblies which previously required expensive three dimensional television-monitoring systems to prevent misfeeds.

B84-10199
SQUARE-CUTTING GRINDER
G. B. DENNIS (Boeing Services International)
Feb. 1985
KSC-11257 **Vol. 8, No. 3, P. 419**
Attachment to grinder used to cut small pipe ends square and smooth, ready for welding. Attachment simple plate bracket fastened to air pencil grinder held against pipe flange to guide grinder.

B84-10200
HOLDER FOR STRAIGHTENING BENT TUBES
A. R. TURNER (Rockwell International Corp.) and E. D. POLZIEN (Rockwell International Corp.)
Feb. 1985
MFS-19705 **Vol. 8, No. 3, P. 420**

One-piece holder restrains bent metal tube against further bending during straightening operation. Holder consists of handle 16 in. (41 cm) long welded to short, strong tube that fits around tube to be straightened.

B84-10201
ANNULAR-TUBE REINFORCER
R. PESSIN (Rockwell International Corp.)
Feb. 1985
MFS-19738 **Vol. 8, No. 3, P. 420**

Cylindrical tool inserts support sleeves into annular space between coaxial tubes to provide local reinforcement. Tool particularly useful when space between outer ends of coaxial tubes is narrow, requiring thin sleeve.

B84-10379
OPTICAL-FIBER-WELDING MACHINE
W. C. GOSS (CALTECH), W. A. MANN (CALTECH), and R. GOLDSTEIN (CALTECH)
Apr. 1985
NPO-15004 **Vol. 8, No. 4, P. 554**

Technique yields joints with average transmissivity of 91.6 percent. Electric arc passed over butted fiber ends to melt them together. Maximum optical transmissivity of joint achieved with optimum choice of discharge current, translation speed, and axial compression of fibers. Practical welding machine enables delicate and tedious joining operation performed routinely.

B84-10380
ROOF POLISHING OF OPTICAL FIBERS
A. R. DHOLAKIA (RCA Corporation)
Apr. 1985
LAR-13070 **Vol. 8, No. 4, P. 554**

Bevealed tip gives optimum coupling efficiency. Abrasive tape used to grind tip of optical fiber. Grinding force depends on stiffness of optical fiber. 'Roof' shape on end of optical glass fiber increases efficiency which couples laser light. End surface angle of 65 degrees with perpendicular required for optimum coupling. Since fiber and tape are light in weight and compliant, ridge defect-free, and chipping on fiber edge totally eliminated.

B84-10381
FABRICATING UNDERWATER ELECTROACOUSTIC TRANSDUCERS
R. L. FERGUSON and R. W. LOVELADY
Apr. 1985
LAR-13007 **Vol. 8, No. 4, P. 555**

Use of retainer ring instead of adhesives simplifies assembly and disassembly. Underwater electroacoustical transducer assembly uses precast silicone rubber compressed between ceramic crystal and metal container. Removable retainer ring holds assembly in place. Method provides proper stress loading, speed and ease of assembly, and way of removing transducer without damaging crystal.

B84-10382
PRESTRESSED THERMAL-PROTECTION PANELS
T. J. DUNN
Apr. 1985
MSC-20254 **Vol. 8, No. 4, P. 556**

Panels held securely with minimum of mounting hardware. Each panel held in place by single screw that pulls it into flat shape from its original shallow-dish shape. Shape and prestressing make panel stiff: resists vibration and withstands large mechanical loads. Panel shape and mounting arrangement not limited to thermal-protection systems but also used on aircraft, building walls, or wherever large surfaces must be covered with stiff, flat sheets easily removed for maintenance.

B84-10383
SORTING TITANIUM WELDING RODS
W. D. ROSS JR. (Rockwell International Corp.) and R. L. BROWN (Rockwell International Corp.)
Apr. 1985
MSC-20588 **Vol. 8, No. 4, P. 557**

Three types of titanium welding wires identified by their resistance to current flow. Welding-wire tester quickly identifies unknown titaniumalloy wire by touching wire with test probe, and comparing meter response with standard response. Before touching wire, tip of test probe dipped into an electrolyte.

B84-10384
FLUORESCENT GAGE INDICATION
C. E. BARNS, B. L. GILBAUGH, B. GIN, W. L. HOLT, P. LESAK, R. MANCINI, and H. F. SPENCER
Apr. 1985
ARC-11397 **Vol. 8, No. 4, P. 558**

Transfer of dye shows quality of contact between two mating parts. Mating parts checked for fit by spreading fluorescent dye on one, making brief light contact with other, and looking (under UV light) for transferred dye. Dye offers greater visibility under ultraviolet illumination, allowing better indication of how precisely parts match and what areas interfere.

B84-10385
SOLAR-ARRAY SUBSTRATE FROM GLASS-REINFORCED CONCRETE
J. L. EIRLS (MB Associates)
Apr. 1985
NPO-15077 **Vol. 8, No. 4, P. 558**

Design elminiates glass superstrate and associated metal framing. Panel has two trapezoidal stiffening ribs for structural support. Strategic placement of ribs with embedded support tubes (standard PVC tubing) minimizes bending moments and resulting stresses produced by installation and windloads. Glass-reinforced concrete panel has smooth flat surface suitable for solar substrate and includes structural bracing for rigidity and design adaptable to mass production.

B84-10386
BONDING TECHNIQUE FOR STIFFENED-SKIN STRUCTURES
P. O. FRICKLAND (CALTECH), E. L. HEADRICK (CALTECH), and T. HASEGAWA (CALTECH)
Apr. 1985
NPO-15994 **Vol. 8, No. 4, P. 559**

Consistent bond thickness achieved even in large, complicated parts. Spring Clamp positions and holds parts assembled on tooling plate. Stiffener and backing bar held against adhesive layer by clamp. Spring action of clamp keeps steady force on pieces as they cure, insuring consistent bond thickness.

B84-10387
SOLDER BONDING FOR POWER TRANSISTORS
H. A. SNYTSHEUVEL (TRW, Inc.) and H. MANDEL (TRW, Inc.)
Apr. 1985
MSC-20570 **Vol. 8, No. 4, P. 559**

Indium solder boosts power rating and facilitates circuit changes. Efficient heat conduction from power transistor to heat sink provided by layer of indium solder. Low melting point of indium solder (141 degrees C) allows power transistor to be removed, if circuit must be reworked, without disturbing other components mounted with ordinary solder that melts at 181 degrees C. Solder allows devices operated at higher power levels than does conventional attachment by screws.

B84-10388
EDGE LABELS FOR MULTILAYER CIRCUIT BOARDS
P. J. ROSSI (Rockwell International Corp.)
Apr. 1985
MSC-20704 **Vol. 8, No. 4, P. 560**

Quick visual inspection identifies out-of-place layers. Small copper pads or other labels on layers present regular

pattern if multilayer circuit board properly assembled and irregular pattern if one or more layers in wrong place. New method faster, cheaper, and more reliable than earlier methods.

B84-10389
GLASS/EPOXY DOOR PANEL FOR AUTOMOBILES
J. L. BAUER JR. (CALTECH)
Apr. 1985
NPO-15057 **Vol. 8, No. 4, P. 561**

Lightweight panel cost-effective. Integrally-molded intrusion strap key feature of composite outer door panel. Strap replaces bulky and heavy steel instrusion beam of conventional door. Standard steel inner panel used for demonstration purposes. Door redesigned to exploit advantages of composite outer panel thinner. Outer panel for automobilie door, made of glass/epoxy composite material, lighter than conventional steel door panel, meets same strength requirements, and less expensive.

B84-10390
STRIPPING THE SHEATH FROM STRANDED CABLES
A. L. PRISK (CALTECH) and J. W. ROTTA (CALTECH)
Apr. 1985
NPO-15082 **Vol. 8, No. 4, P. 561**

Device similar to tubing cutter removes tough plastic cover. Insulation stripper is 3 in. (7.6 cm) long and 1.5 (3.8 cm) in diameter. Two rollers are small-diameter bearings. Cutter blade journaled for rotation between pair of similar bearings. Bearings either pin or ball types of suitable dimensions.

B84-10391
GRAVITATIONAL EFFECTS ON CRYSTAL GROWTH BY VAPOR TRANSPORT
J. A. ZOUTENDYK (CALTECH) and W. M. AKUTAGAWA (CALTECH)
Apr. 1985
NPO-15853 **Vol. 8, No. 4, P. 562**

Crystal-growth apparatus makes is possible to measure growth rates in three directions: up, down, and horizontal. Sealed in quartz ampoule, charge of source material vaporizes and condenses in crystalline state at colder end of tube. Apparatus allows effect of gravity on crystal growth determined quantitatively.

B84-10392
MAKING CUBIC SILICON CARBIDE SEMICONDUCTORS
J. POWELL, H. WILL, and S. NISHINO (Kyoto University)
Apr. 1985
LEW-14018 **Vol. 8, No. 4, P. 563**

Thin buffer layer of SiC minimizes effects of lattice mismatch. Approach consists of growing single-crystal layer of cubic SiC on single-crystal silicon (Si) wafer by chemical-vapor deposition (CVD). Process developed for production of large-area single-crystal wafers of cubic silicon carbide (SiC) for semiconductor devices; also used to make devices themselves. Applications include electronics for high temperature (up to 900 C) and electronics for very high frequencies.

B84-10393
GAS ATMOSPHERES IMPROVE SILICON-RIBBON QUALITY
F. V. WALD (Mobil Tyco Solar Energy Corp.) and J. P. KALEJS (Mobil Tyco Solar Energy Corp.)
Apr. 1985
NPO-15129 **Vol. 8, No. 4, P. 564**

Growing crystal surrounded by gas containing carbon or oxygen. Ribbon of solid silicon, edgewise, grows from pool of molten silicon in die. Gases flowing through orifice ensure longer diffusion length and less contaminiation by carbide particles in product.

B84-10394
CONTOURED ORIFICE FOR SILICON-RIBBON DIE
B. H. MACKINTOSH (Mobil Tyco Solar Energy Corp.)
Apr. 1985
NPO-15126 **Vol. 8, No. 4, P. 565**

Die configuration encourages purity and stable growth. Contour of die orifice changes near ribbon edges. As result, silicon ribbon has nearly constant width and little carbon contamination. Die part of furnace being developed to produce high-quality, low-cost material for solar cells.

B84-10395
TOP-COATING SILICON ONTO CERAMIC
J. D. HEAPS (Honeywell, Inc.), L. D. NELSON (Honeywell, Inc.), and J. D. ZOOK (Honeywell, Inc.)
Apr. 1985
NPO-15125 **Vol. 8, No. 4, P. 565**

Polycrystalline silicon for solar cells produced at low cost. Molten silicon poured from quartz trough onto moving carbon-coated ceramic substrate. Doctor blade spreads liquid silicon evenly over substrate. Molten material solidifies to form sheet of polycrystalline silicon having photovoltaic conversion efficiency greater than 10 percent. Method produces 100-um-thick silicon coatings at speed 0.15 centimeter per second.

B84-10396
BONDING HEAT-RESISTANT FABRIC TO TILE
J. W. HOLT (Rockwell International Corp.) and L. W. SMISER (Rockwell International Corp.)
Apr. 1985
MSC-20540 **Vol. 8, No. 4, P. 566**

Acid etching, densification, and silica cement ensure strong bond. Key step in preparation for bonding to glazed tile is etching quartz fabric and tile with acid. This increases adhesion of silica cement used to form bond. Procedures use high-temperature materials exclusively and therefore suitable for securing flexible seals and heat barriers around doors and viewing ports in furnaces and kilns.

B84-10397
EXPLOSIVE WELDING FOR REMOTE APPLICATIONS
L. J. BEMENT
Apr. 1985
LAR-13119 **Vol. 8, No. 4, P. 567**

Explosive seam welding produces up to 100-percent joint strength. Ribbon explosive activated by remote energy source produces metallurgically sound joint. Success of technique verified for joints between like metals and joints between two different metals. Applications include structural assembly in toxic atmospheres and in radioactive or otherwise hazardous environments.

B84-10398
WELDING MANY THIN METAL LAYERS
B. O. HARTWELL (Ametek), P. CARAS (Ametek), and P. H. HOBBES (Ametek)
Apr. 1985
MSC-20698 **Vol. 8, No. 4, P. 568**

Electron-beam welding yields reliable, leakproof joints. Welding bands (also called 'doublers') sandwiched between layers welded to increase final weld-section thickness. New technique ensures repeatable leakproof assemblies.

B84-10399
STRONG, LIGHWEIGHT CURVED PANELS
R. MOLHO (McDonnell Douglas Corp.) and H. L. BESTOR (McDonnell Douglas Corp.)
Apr. 1985
MSC-16278 **Vol. 8, No. 4, P. 569**

Sandwich construction gives panels structural efficiency. Large panels with compound curvatures are formed from a honeycomb core faced with sheets of graphite/epoxy cloth and tape. Developed for pod on Space Shuttle, construction readily adapted to curved skin panels on cars, trucks, and airplanes.

B84-10400
TAPE-MOUNTED THERMOCOUPLE

K. S. MACDAVID (CALTECH)
Apr. 1985
NPO-16291 **Vol. 8, No. 4, P. 569**
Thermocouple junctions soldered to copper-foil adhesives allow easy assembly.

B84-10401
CONNECTOR-ARRAY ATTACHMENT MATRIX
T. J. MALONEY (AIA Research Corp.)
Apr. 1985
NPO-15778 **Vol. 8, No. 4, P. 569**
Factory-assembled electrical/mechanical connectors on flexible sheets improve installation efficiency.

B84-10402
SNAPRING QUICK FASTENER
A. H. WILSON (CALTECH)
Apr. 1985
NPO-15724 **Vol. 8, No. 4, P. 569**
Snapring fastener allows quick attachment and detachment of solar panels. Springy structure bent to fit any recess, making solar-panel removal or repair extremely simple.

B84-10403
SPLICING EFFICIENTLY COUPLES OPTICAL FIBERS
G. F. LUTES (CALTECH)
Apr. 1985
NPO-16294 **Vol. 8, No. 4, P. 569**
Method of splicing single-mode optical fibers results in very low transmission losses through joined fiber ends. Coupling losses between joined optical-fiber ends only 0.1 dB. Method needs no special operator training.

B84-10404
AUTOMATED SOLAR-PANEL FABRICATOR
J. J. HAGERTY (MB Associates)
Apr. 1985
NPO-16205 **Vol. 8, No. 4, P. 569**
Automated computer-controlled system based on standard commercial industrial robot takes solar cells and other raw materials and assembles them into completed solar panels.

B84-10405
CLOSE-OUT PLUGS
T. ADAMS (Rockwell International Corp.)
Apr. 1985
MFS-19370 **Vol. 8, No. 4, P. 570**
Externally-applied circular plug seals holes in walls up to 0.44 (12 mm) in diameter.

B84-10406
ACOUSTIC LEVITATION SYSTEM
P. M. GAMMELL (CALTECH), T. G. WANG (CALTECH), A. CROONQUIST (CALTECH), and M. C. LEE (CALTECH)
Apr. 1985
NPO-16146 **Vol. 8, No. 4, P. 570**
Dense materials, such as steel balls, continuously levitated with energy provided by efficient high-powered siren in combination with shaped reflector. Reflector system, consisting of curved top reflector and flat lower reflector, eliminates instability in spatial positioning of sample.

B84-10407
ACOUSTIC POSITION SERVOSYSTEM
E. W. LEUNG (CALTECH), C. P. LEE (CALTECH), and T. G. WANG (CALTECH)
Apr. 1985
NPO-15936 **Vol. 8, No. 4, P. 570**
Servosystem automatically centers levitated objects within given volume.

B84-10408
HEAT-SHIELD GAP FILLER
D. B. LEISER, D. A. STEWART, M. SMITH, C. ESTRELLA, and H. E. GOLDSTEIN
Apr. 1985
ARC-11310 **Vol. 8, No. 4, P. 570**
Ceramic cloth strips provide flexible, easily replaceable insulating filler. Filler prevents hot gas from flowing between heat-shield tiles while allowing space for thermal expansion and contraction. Strips easily replaced when necessary.

09 MATHEMATICS AND INFORMATION SCIENCES

B84-10202
CALCULATING CLOSED-LOOP SENSITIVITY TO PARAMETER VARIATIONS
D. B. SCHAECHTER (CALTECH)
Feb. 1985
NPO-15941 **Vol. 8, No. 3, P. 423**
Performance sensitivity calculated by back substitution. Original Lyapunov equation differentiated two times with respect to parameter p. Each differential turns out to yield Lyapunov equation for first and second derivatives with respective to parameter p of steady-state covariance of state variables. Derivatives desired closed-loop performance sensitivities.

B84-10203
TECHNI-KITS AND TECHNI-KIT BUILDING SYSTEMS
E. D. CALLENDER (CALTECH), C. HARTSOUGH (CALTECH), R. V. MORRIS (CALTECH), and Y. YAMAMOTO (CALTECH)
Feb. 1985
NPO-15956 **Vol. 8, No. 3, P. 423**
Techni-kits consists of theories, methods, standards and computer based tools that assist in design of information-intensive systems. Techni-kit 'building system' is techni-kit that builds techni-kits.

B84-10204
FAST TWO-DIMENSIONAL DIGITAL-FILTER HARDWARE
T. R. EDWARDS
Feb. 1985
MFS-25876 **Vol. 8, No. 3, P. 424**
Report describes principles of hardware implementation of two-dimensional 5 by 5 convolute-integer low pass filter. Filter processes image data points fast enough for real-time use in image analysis and enhancement.

B84-10205
DESIGN PRIMER FOR REED-SOLOMON ENCODERS
M. PERLMAN (CALTECH) and J. J. LEE (CALTECH)
Feb. 1985 See Also NASA CR-16974 (N83-17141/NSP)
NPO-15568 **Vol. 8, No. 3, P. 424**
Design and operation of Reed-Solomon (RS) encoders discussed in document prepared as instruction manual for computer designers and others in dataprocessing field. Conventional and Berlekamp architectures compared. Engineers who equip computer memory chips with burst-error and dropout detection and correction find report especially useful.

B84-10206
RESEARCH-CONCEPT EVALUATION
M. J. WHITE (ARINC Research Corp.) and W. KOLB (ARINC Research Corp.)
Feb. 1985
LAR-13143 **Vol. 8, No. 3, P. 425**
Concepts ranked according to potential benefit/cost ratios. ARINC Researh Concept Evaluation Methodology (ARCEM) program provides powerful tool for organization and planning of research activities indicating which con-

cepts provide greatest benefit for investment and determines number of concepts implemented to justify expenditures for development of generic technologies.

B84-10207
RELATIONAL INFORMATION MANAGEMENT DATABASE SYSTEM
O. O. STORAASLI, W. J. ERICKSON (Boeing Commercial Airplane Co.), F. P. GRAY (Boeing Commercial Airplane Co.), D. L. COMFORT (Boeing Commercial Airplane Co.), S. O. WAHLSTROM (Boeing Commercial Airplane Co.), and G. VON LIMBACH (Boeing Computer Services Co.)
Feb. 1985
LAR-12943; LAR-12944; LAR-12945 Vol. 8, No. 3, P. 425
DBMS with several features particularly useful to scientists and engineers. RIM5 interfaced with any application program written in language capable of Calling FORTRAN routines. Applications include data management for Space Shuttle Columbia tiles, aircraft flight tests, high-pressure piping, atmospheric chemistry, census, university registration, CAD/CAM Geometry, and civil-engineering dam construction.

B84-10208
SDDL: SOFTWARE DESIGN DOCUMENTATION LANGUAGE
H. KLEINE (CALTECH), D. E. CALLENDER (CALTECH), and T. M. ZEPKO (CALTECH)
Feb. 1985
NPO-16201; NPO-16202 Vol. 8, No. 3, P. 426
Promotes effective communications between software designer and user. SDDL successful on tasks ranging from small, one-person informal projects to large projects of hundreds of formally published pages of design.

B84-10209
SOFTWARE COST-ESTIMATION MODEL
R. C. TAUSWORTHE (CALTECH)
Feb. 1985
NPO-15862 Vol. 8, No. 3, P. 426
Software Cost Estimation Model SOFTCOST provides automated resource and schedule model for software development. Combines several cost models found in open literature into one comprehensive set of algorithms. Compensates for nearly fifty implementation factors relative to size of task, inherited baseline, organizational and system environment and difficulty of task.

B84-10210
SOFTWARE DESIGN ANALYZER SYSTEM
R. C. TAUSWORTHE (CALTECH)
Feb. 1985
NPO-16234 Vol. 8, No. 3, P. 426
CRISP80 software design analyzer system a set of programs that supports top-down, hierarchic, modular structured design, and programing methodologies. CRISP80 allows for expression of design as picture of program.

B84-10211
INTEGRATED PROCUREMENT MANAGEMENT SYSTEM, VERSION II
L. J. COLLIER (Computer Science Corp.)
Feb. 1985
MSC-20278 Vol. 8, No. 3, P. 427
Integrated Procurement Management System, Version II (IPMS II) is online/ batch system for collecting developing, managing and disseminating procurementrelated data at NASA Johnson Space Center. Portions of IPMS II adaptable to other procurement situations.

B84-10212
LANGUAGE FOR ALLOCATION AND NETWORK SCHEDULING
J. K. WILLOUGHBY (Science Applications, Inc.)
Feb. 1985
MSC-20633 Vol. 8, No. 3, P. 427
Programing Language for Allocation and Network Scheduling, Plans, handles many scheduling requirements of Space Shuttle program. Also generalized, high-level tree manipulation language.

B84-10213
A VISUALLY ORIENTED TEXT EDITOR
J. E. GOMEZ (CALTECH)
Feb. 1985
NPO-15088 Vol. 8, No. 3, P. 427
HERMAN employs Evans & Sutherland Picture System 2 to provide screenoriented editing capability for DEC PDP-11 series computer. Text altered by visual indication of characters changed. Group of HERMAN commands provides for higher level operations. HERMAN provides special features for editing FORTRAN source programs.

B84-10214
STRUCTURED FORTRAN PREPROCESSOR
J. A. FLYNN (CALTECH), C. L. LAWSON (CALTECH), W. VAN SNYDER (CALTECH), and H. N. TSITSIVAS (CALTECH)
Feb. 1985
NPO-15726 Vol. 8, No. 3, P. 428
SFTRAN3 supports structured programing in FORTRAN environment. Language intended particularly to support two aspects of structured programing -nestable single-entry control structures and modularization and top-down organization of code. Code designed and written using these SFTRAN3 facilities have fewer initial errors, easier to understand and less expensive to maintain and modify.

B84-10215
NASTRAN NASTPLT PLOTTING POST PROCESSOR
R. STRANG (Computer Sciences Corp.)
Feb. 1985
GSC-12833 Vol. 8, No. 3, P. 428
NASTRAN NASTPLT Plotting Post Processor reads NASTRAN-generated NASTPLT plot files, checks file contents for validity and translates NASTPLT plot commands into appropriate calls to plotting routines for either CALCOMP Tektronix PLOT10, or Versatec plotting systems.

B84-10216
ALGORITHM SOLVES CONSTRAINED AND UNCONSTRAINED OPTIMIZATION PROBLEMS
M. A. DENSON (McDonnell Douglas Corp.)
Feb. 1985
MSC-20683 Vol. 8, No. 3, P. 428
Is quasi-Newton iteration utilizing Broyden/Fletcher/Goldfarb/Shanno update on inverse Hessian matrix. Capable of solving constrained optimization unconstrained optimization and constraints only problems with one to five independent variables from one to five constraint functions and one dependent function optimized.

B84-10217
HANDLING SOFTWARE REQUESTS FOR COMMANDS
W. KING JR. (IBM Corp.)
Feb. 1985
KSC-11226 Vol. 8, No. 3, P. 429
Software component created expressly to provide interface between dedicated command buffer and components requesting command issuance. Component resolves problems that arise when software processes command requests from other subsystems and several requests received at approximately same time.

B84-10218
PRIORITY-BASED DISPATCHING ALGORITHM
G. OUZTS (IBM Corp.)
Feb. 1985
KSC-11277 Vol. 8, No. 3, P. 429
Tasks assigned to different queues based on priority. Proposed algorithm controls execution of transient tasks of different priorities in real-time computation.

B84-10219
MORE EFFICIENT STRUCTURAL DESIGN BY OPTIMALITY CRITERIA
R. LEVY (CALTECH)
Feb. 1985
NPO-15832; NPO-15993 **Vol. 8, No. 3, P. 429**
Computer algorithm aids in selection of active constraints on structural design via optimality-criterion method-highly useful way of ensuring lightweight, low-cost structures.

B84-10220
ADDING STALE-DATA FLAG TO AND ERROR-CORRECTING CODE
N. BELL SR. (IBM Corp.), J. BURKAVAGE (IBM Corp.), and J. WICKS (IBM Corp.)
Feb. 1985
KSC-11134 **Vol. 8, No. 3, P. 429**
A suitable constant 'exclusive-Ored' with ECC to flag data without impairing detection of correctable errors.

B84-10221
ROOT-LOCUS ALGORITHMS
E. R. WECHSLER (CALTECH)
Feb. 1985
NPO-16154 **Vol. 8, No. 3, P. 430**
Two algorithms for use on programable pocket calculators allow plotting of individual points on root-locus diagram with or without time delay.

B84-10222
ALGORITHMS FOR FINITE-ELEMENT EQUATIONS
M. A. SALAMA (CALTECH), R. MELOSH (Duke University), and S. UTKU (Duke University)
Feb. 1985
NPO-16029 **Vol. 8, No. 3, P. 430**
Five direct and five iterative algorithms for finite element equations in linear equilibrium problems investigated for number of parallel computer architectures and their basic computation methods compared.

B84-10223
SOFTWARE-IMPLEMENTATION PLAN
G. JACOBSON (CALTECH) and A. SPINAK (CALTECH)
Feb. 1985
NPO-16123 **Vol. 8, No. 3, P. 430**
Top-down implementation plan provides a methodology for solving problems in or aiding software engineering design.

B84-10224
TEST SEQUENCES FOR REED-SOLOMON ENCODERS
J. J. LEE (CALTECH)
Feb. 1985
NPO-15542 **Vol. 8, No. 3, P. 430**
Theory of Reed-Solomon codes yields sequences of input test symbols. Two specific sequences worked out for codes of 8 bits per symbol with 223 information symbols and 32 parity check symbols per code words. Test patterns also used for decoders.

B84-10409
FLIGHT-STABILITY EXTREMES CALCULATED FROM THE UNCERTAINTY ELLIPSE
D. F. DOMINIK (Rockwell International Corp.)
Apr. 1985
MSC-20308 **Vol. 8, No. 4, P. 573**
Tangents and normals to ellipse derived for situations with two correlated aerodynamic force or moment variables having normally (Gaussian) distributed uncertainty. Although transformations and vector calculations tedious when done by hand, equations in closed form and give rapid results when performed by computers or programable desk calculators. Probability extremes of ratios and magnitude obtained directly, without repeated table lookup or other complication.

B84-10410
PREDICTING THE RELIABILITY OF SOLAR-CELL INTERCONNECTIONS
G. R. MON (CALTECH), D. M. MOORE (CALTECH), and R. G. ROSS JR. (CALTECH)
Apr. 1985
NPO-15976 **Vol. 8, No. 4, P. 574**
The reduction of life expectancy by thermal cycling calculated during design. Connections between solar cells critical parts of solarcell arrays generating electric power. Reliability affects life expectancy of modules, panels, and arrays. Used to predict stress-cycle lifetimes of such structures as arches, walkways, cylindrical ribbing of aircraft fuselages and submarine hulls, and pipeline expansion loops. Testing costs reduced by about 90 percent.

B84-10411
PREDICTING SEVERE DUSTSTORMS
P. M. WOICHESHYN (CALTECH)
Apr. 1985
NPO-14999 **Vol.8, No. 4, P. 575**
Combined human/machine forecasting technique shows promise. Severe duststorms in Great Plains forecast with fair reliability. Forecasts derived from combination of human expertise and variety of meteorological information sources, including all current and recent weather observations, standard National Meteorological Center (NMC) computer analyses for surface and upper air, and NMC 12-, 24-, 36-, and 48-hour prognostication charts generated by Limited Fine Mesh computer model.

B84-10412
COST CONSIDERATIONS IN NONLINEAR FINITE-ELEMENT COMPUTING
S. UTKU (Duke University), R. J. MELOSH (Duke University), M. ISLAM (Duke University), and M. SALAMA (CALTECH)
Apr. 1985
NPO-16237 **Vol. 8, No. 4, P. 576**
Conference paper discusses computational requirements for finiteelement analysis using quasi-linear approach to nonlinear problems. Paper evaluates computational efficiency of different computer architecturtural types in terms of relative cost and computing time.

B84-10413
SOURCE PRE-PROCESSOR OR INTERFACE-SPECIFICATION LANGUAGE
W. J. LUEBKERT (Telos Computing, Inc.)
Apr. 1985
NPO-15814 **Vol. 8, No. 4, P. 576**
A user's guide available for source program preprocessor (SPP) method for producing descriptions of data structures or records. SPP enhances usefulness of Program Design Language (PDL) - software-design tool decreases debugging time and improves quality of source programs.

B84-10414
LIBRARY INFORMATION-PROCESSING SYSTEM
Innovator Not Given (Informatics General Corp.) Apr. 1985
GSC-12861 **Vol. 8, No. 4, P. 576**
System works with Library of Congress MARC II format. System composed of subsystems that provide wide range of library information processing capabilities. Format is American National standards Institute (ANSI) format for machine-readable bibliographic data. Adaptable to any medium-to-large library.

B84-10415
ORBITAL AND GEODETIC ERROR ANALYSIS
T. FELSENTREGER, P. MARESCA (Business Technological Systems), and R. ESTES (Busniess Technological Systems)
Apr. 1985
GSC-12768 **Vol. 8, No. 4, P. 577**
Results that previously required several runs determined in more computer-efficient manner. Multiple runs performed

only once with GEODYN and stored on tape. ERODYN then performs matrix partitioning and linear algebra required for each individual error-analysis run.

B84-10416
MANAGING SOFTWARE DESIGN AND DESIGN CHANGES
R. E. LOESH (CALTECH)
Apr. 1985
NPO-15331 **Vol. 8, No. 4, P. 577**

Microprocessor-based system for document production work scheduling, and change control and management information aids in design, development, and control of software. Main components Z80 microprocessor, floppydisk and hard-disk drives, and a character printer. System linked to large computer. Major software components are control program monitor (CP/M), text-editing and wordprocessing system, workbreakdown-schedule processor, and database management tool.

B84-10417
ERROR CORRECTION FOR TANDEM DATA-TRANSMISSION PATHS
E. C. POSNER (CALTECH) and A. L. RUBIN (CALTECH)
Apr. 1985
NPO-16125 **Vol. 8, No. 4, P. 578**

Mathematical analysis for digital data transmission calculates optimum number of binary error-correcting repeaters to install in given number of wideband channel links. Asymptotic results compared to computed numerical results.

B84-10418
SIMPLIFIED CONVOLUTION CODES
T. K. TRUONG (CALTECH) and I. S. REED (CALTECH)
Apr. 1985
NPO-16251 **Vol. 8, No. 4, P. 578**

Simple recursive algorithm efficiently calculates minimum-weight error vectors using Diophantine equations. Recursive algorithm uses general solution of polynomial linear Diophantine equation to determine minimum-weight error polynomial vector in equation in polynomial space.

B84-10419
PREDICTIVE SMOOTHING-CONVOLUTION ALGORITHM
J. C. ALVAREZ (Ford Aerospace Communications Corp.)
Apr. 1985
MSC-20604 **Vol. 8, No. 4, P. 578**

Signal estimate continually updated with or without phase correction. Technique useful where signal varies slowly with respect to sampling rate.

B84-10420
PARALLEL VLSI ARCHITECTURE
T. K. TRUONG (CALTECH), I. REED (University of Southern California), C. YEH (University of Southern California), and H. SHAO (University of California)
Apr. 1985
NPO-16124 **Vol. 8, No. 4, P. 578**

Fermat number transformation convolutes two digital data sequences. Very-large-scale integration (VLSI) applications, such as image and radar signal processing, X-ray reconstruction, and spectrum shaping, linear convolution of two digital data sequences of arbitrary lenghts accomplished using Fermat number transform (ENT).

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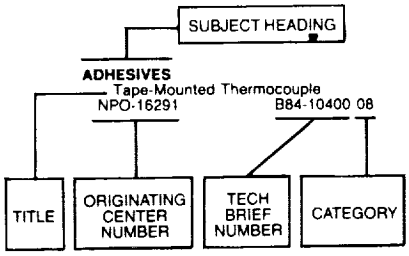

The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number, e.g., B84-10400, is located under and to the right of the title and is followed by a two-digit number, e.g., 08, which designates the subject category in which the entire entry can be found.

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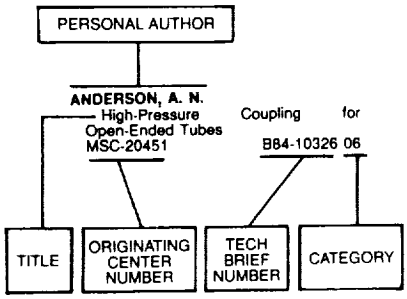

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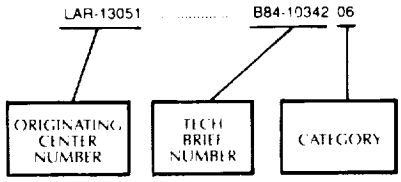

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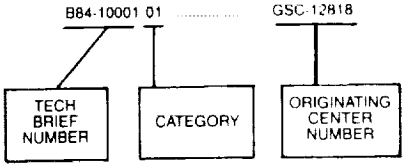

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